VOLUME [illegible] [W. B. No. [illegible]] NUMBER 6

UNITED STATES DEPARTMENT OF COMMERCE
JESSE H. JONES, *Secretary*

WEATHER BUREAU - F. W. Reichelderfer, *Chief*

MONTHLY WEATHER REVIEW

JUNE 1942

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CORRECTIONS

MONTHLY WEATHER REVIEW, March 1942, vol. 70: Page 50, Oakland, 3,000-meter pressure level, change [illegible] to [illegible].

MONTHLY WEATHER REVIEW, April 1942, vol. 70: Page 72, table 1, Anchorage, Alaska, 18,000-ft. level, "[illegible]" should be "[illegible]."

MONTHLY WEATHER REVIEW, May 1942, vol. 70: Page 101, table 3, section headed, "Above 5,000 meters," 5th line down, delete "40.0 w 8,91[illegible] 4 St. Louis, Mo.," and substitute, "56.0 ssw 8,[illegible]0 2 Dodge City, Kans."; page 102, 1st column, next to last paragraph, 5th line, the pressure at the [illegible]-foot level should be [illegible] mb.

MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

VOL. 70, No. 6
W. B. No. 1363

JUNE 1942

CLOSED AUG. 3, 1942
ISSUED SEPT. 12, 1942

THE HEAVY RAINS OVER SOUTHEAST TEXAS, NOVEMBER 22–25, 1940

By JAMES H. FERGUSON

[Weather Bureau, Fort Worth, Tex., April 1941]

The paper gives a three-dimensional picture of the meteorological conditions over the southern United States during November 21 to 25, 1940, inclusive. The air-mass designations are based on those of the Bergeron [1] classification as modified by Willett [2] and Showalter [3]; Showalter's values for autumn are used. The isentropic cross sections are similar to those used by Pierce.[4] The method of locating fronts is that suggested by Rossby [5] and Willett [6]: "* * * true air-mass boundaries must coincide with isentropic surfaces." The isentropic condensation temperature is used for determining the amount of lift that a front will create, using winds aloft to show the fourth, fronts are easily found; fifth, all isentropic surfaces are shown; and, finally, the nearness to saturation at any point can be determined.

On the synoptic map of November 21, 1940, at 1:30 a. m., E. S. T. (fig. 1a), a cold front extended from a weak LOW center of approximately 1010.5 mb. (29.84 inches) in eastern Kansas southward to central East Texas, near Laredo. The cold front was developing definite quasi-stationary characteristics in the interior of southeast Texas, which were indicated by rapidly falling pressure tendencies to the northwest of the front over central and northwest Texas. As will be shown later, these falls were

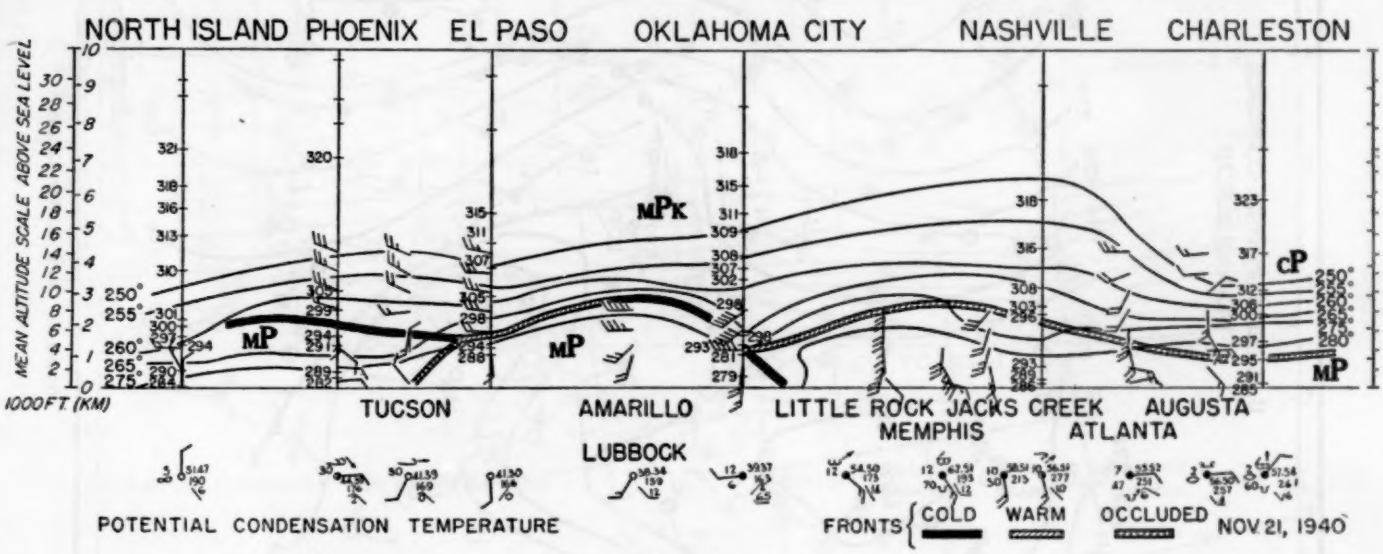

FIGURE 1.

air flow along constant potential temperature (or isentropic) surfaces; the isentropic condensation temperature of a mass of air is defined as the temperature it would have if it were raised adiabatically without gain or loss of water vapor to the condensation level.[7] The advantages of this type of cross section are shown by Pierce [8] to be: first, there are a less number of lines on the cross section; second, convective instability is roughly shown; third, amount of lift necessary for condensation is easily found; significant according to Norton,[9] Petterssen [10] and others, who have pointed out that when a cold front slows down or becomes quasi-stationary its characteristics often change from those of a cold front to those of a warm front; furthermore, cyclonic disturbances develop easily on such fronts. Experience in forecasting along the Gulf Region has taught that wave developments are generally the rule in such cases.

Warm, moist, stable mTw air (maritime tropical air) lay to the south of the cold front along the East Texas coast, with specific humidity 14.7 grams per kilogram at the surface at Brownsville and extended to near 3 kilometers, with drier, cool, unstable air above (fig. 2). Over Texas was a weakening east-west high-pressure ridge, approximately 1017 mb., of mPk air with the specific humidity near 5 grams per kilogram from the surface to 4 kilometers, but cPw mixed with mPw westward to

[1] Bergeron, T., "Uber die dreidimensional verknüpfende Wetteranalyse," *Geofysiske Publikasionar*, Oslo, 1928, vol. V, No. 6.
[2] Willett, H. C., "American Air Mass Properties," *Massachusetts Institute of Technology Papers in Physical Oceanography and Meteorology*, vol. II, No. 2; June 1933.
[3] Showalter, A. K., "Further Studies of American Air-Mass Properties," MONTHLY WEATHER REVIEW, vol. 67, No. 7, pp. 204–218, July 1939.
[4] Pierce, C. H., "On the use of Vertical Cross Sections in Studying Isentropic Flow," MONTHLY WEATHER REVIEW, vol. 66, No. 9, pp. 266–267, September 1938.
[5] Rossby, C. G., "Isentropic Analysis," *Bulletin of the American Meteorological Society*, vol. 18, No. 6–7, p. 201, June–July 1937.
[6] Willett, H. C., "Discussion and Illustration of Problems Suggested by the Analysi, of Atmospheric Cross-Sections." Papers in Physical Oceanography and Meteorology, Massachusetts Institute of Technology, and Woods Hole Oceanographic Institutions July 1935: vol. IV, No. 2.
[7] Byers, H. R., "On the Thermodynamic Interpretation of Isentropic Charts," MONTHLY WEATHER REVIEW, vol. 66, No. 3, pp. 63–68, March 1938
[8] Pierce, *op. cit.*
[9] Norton, Grady, "Studying Weather Forecasting in the Lower Mississippi Valley" (unpublished).
[10] Petterssen, S., *Weather Analysis and Forecasting*, 1940.

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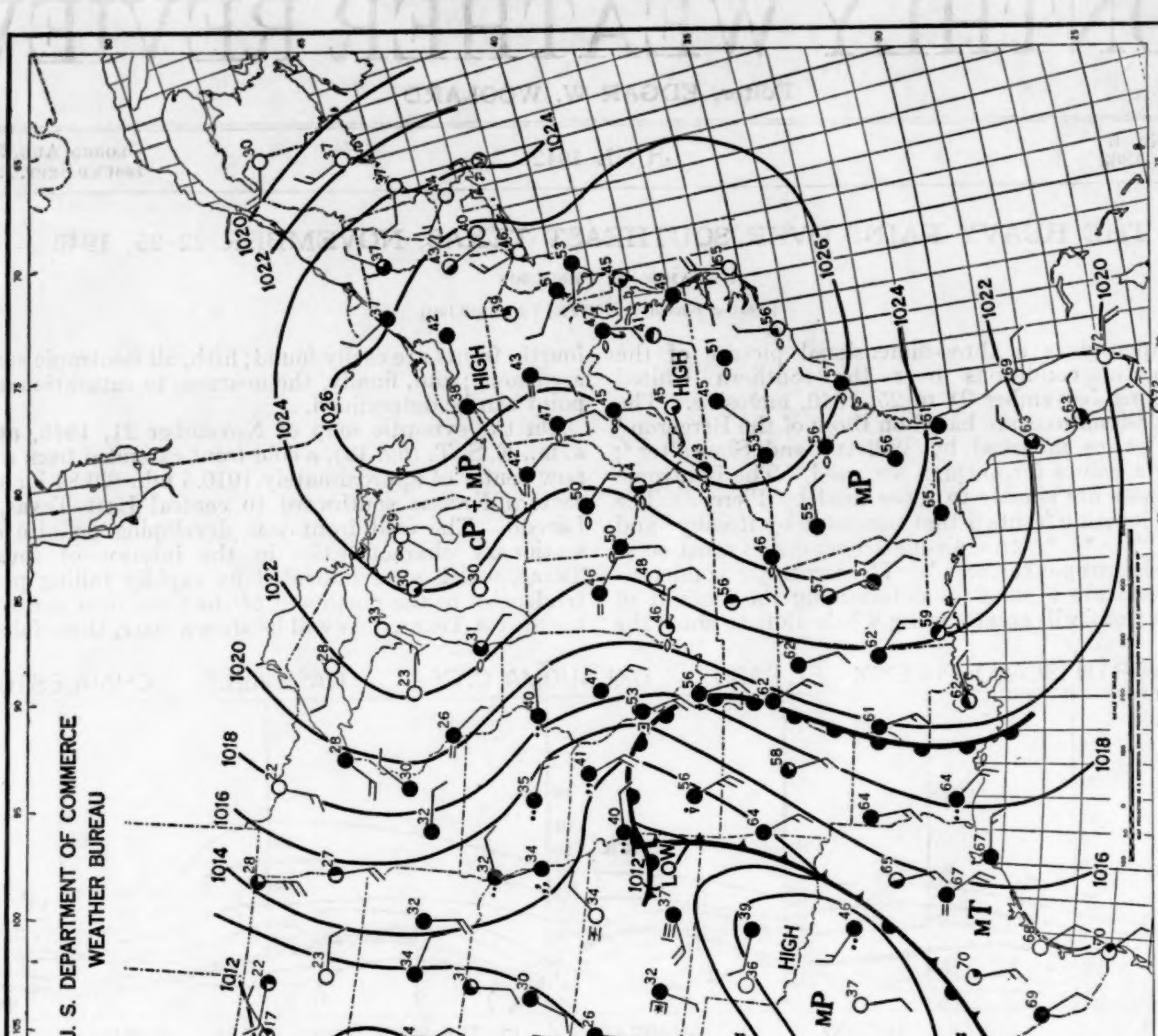


FIGURE 1a. 1:00 a. m., Nov. 21, 1940.

California, and very dry air above 2 kilometers west of El Paso, Tex., as shown by the soundings at El Paso and westward.

It will be noted on the cross section (fig. 2) that the air aloft between Brownsville and Waco, Tex., just to the west of the region where the heavy rains developed, was very moist and stable to about 2,500 meters and was rather dry and unstable above. This condition of "convective instability" is inducive to heavy rain showers once the air is lifted over a region; the air above the moist layer becomes increasingly unstable as it is forced upward, cooling at or near the dry adiabatic rate, while the lower level moist air cools much slower and near the pseudo-adiabatic rate. This condition plus the continuous inflow of moist air over southern Texas, from the south, for the following 3 days (November 22, 23, and 24) is shown graphically on the isentropic surface with a potential temperature of 298° in figures 11, 12, and 13. This potential surface is a very representative one as it was on an average at about 1 km., well above any surface inversions. The air aloft over the Southern Plateau States of New

course, the moisture content is high, the intermediate and upper levels are unstable with respect to dry air and enough convergence is present to start the processes of condensation and precipitation.

After the "wave" of low pressure had developed strongly over southeast Texas November 25 (fig. 8a), the southerly current highly charged with moisture was cut off and replaced in the intermediate and high levels by a dry northwesterly current as shown on the isentropic chart of November 26 (fig. 14), and the rain stopped suddenly as a result of this on the afternoon of November 25.

The isentropic cross section (fig. 1) shows potential temperatures and isentropic condensation temperature isotherms, both in absolute temperature for each 5 degrees. From the slow increase of potential temperature with elevation, instability of the air is apparent above the cold surface layers immediately behind (to west) of the front. Although the cold front near McAlester, Okla., shows a slope of about 1 mile in 100 miles, the low condensation temperatures above 2 kilometers to the west and east of the cold front restrict the precipitation and clouds to a strip

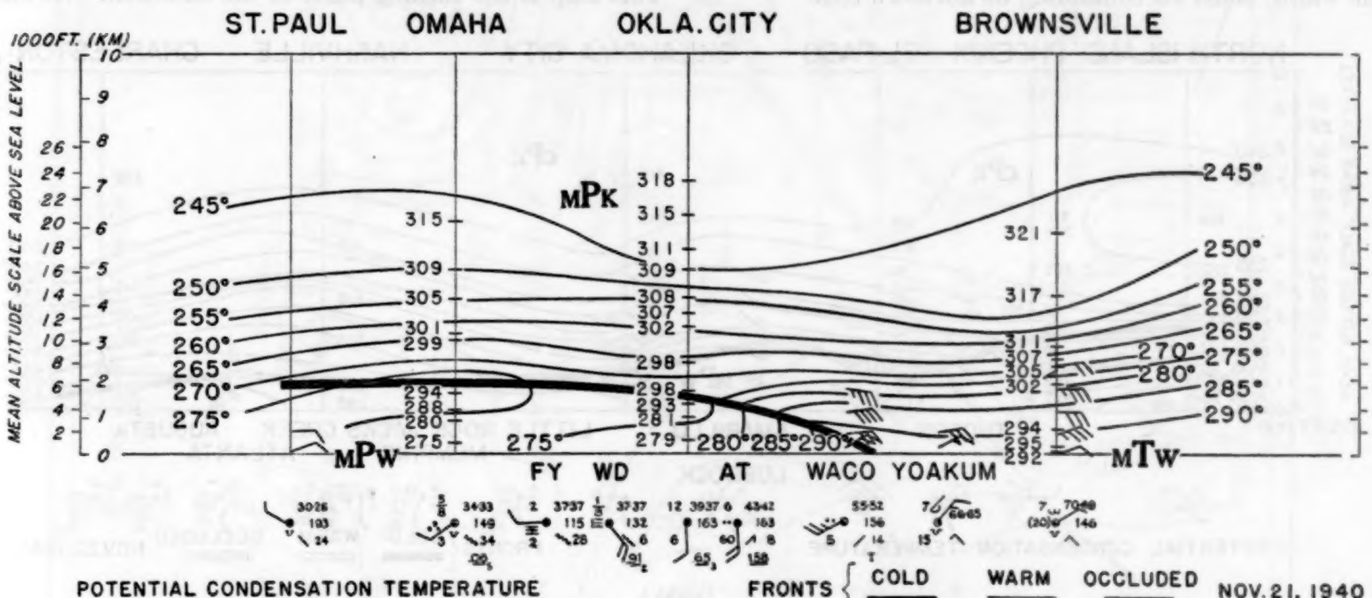


Figure 2.

Mexico, Arizona, and west Texas, was very cold in the levels above 2,500 meters and very unstable. The inflow of the warm moist air northwestward into the region occupied by the shallow cold air on November 21, figures 1, 1a, and 2, resulted in a concentrated thunderstorm activity when the rain once began in the region of southeast Texas. The air aloft was becoming more and more unstable as is evident from the slow fall of potential temperature over the Brownsville region. With the approach of cold air from the Northern Plains States on November 22 (fig. 3a), the rains and thunderstorms over the Palestine, Tex., area began to intensify; and by November 23 (fig. 5a), a definite "wave" of low pressure seemed to be forming over a line from southern Arkansas to Waco, Tex., as an isobaric deformation was evident and rapidly falling tendencies of as much as 1.6 mb. were noted in southern Arkansas and northeast Texas. It has been observed in many other heavy-rain-type maps over southeast Texas, notably, December 1940, the spring of 1941, and October 29–31, 1941, that the heaviest rains are associated with that area where the "wave" begins to form, provided, of

of approximately 100 miles between McAlester, Okla., and Fort Smith, Ark., extending northward and southward.

As shown on the north-south cross section (fig. 2), the rain covered an area from near Omaha, Nebr., to Waco, Tex. An example of the use of cross section for finding amount of lift necessary for condensation is as follows: The air over Brownsville, Tex., at 937 mb. had a temperature of 291° and an isentropic condensation temperature of 288°, a difference of 3° C. Since air cools approximately 1° C. per 100 meters, only 300 meters lifting was required for condensation. This is first realized near Waco, Tex., where the potential surfaces rise sharply enough above the cold front to produce precipitation. Although no observations were made within the cloud it is conceivable that the cloud deck was supercooled to freezing or below over the rain area, as was apparent in figure 1 over the Oklahoma City area. During this entire rain period the moisture increased steadily over south Texas, as seen on subsequent cross sections, starting with near 15 grams at Brownsville on the 21st and in-

creasing to near 18 grams per kilogram on the 23d, at the surface level.

During the night of November 22, moderate to severe thunderstorms and heavy rains occurred over southeast Texas as the warm, moist Gulf (mTk) air overran the cold air remaining at the lower levels in central southeast Texas. This area was where the cold front became quasi-stationary the day before, the 21st, a fact which is extremely significant as the mTw air to the south of the front was not displaced and later started northward, overrunning the stagnant, stable, cold, moist air. The quasi-stationary front over southeast Texas had advanced northwestward as a warm front to north central Texas. Light precipitation, mostly drizzle, as is usually the case, occurred over south and central Texas in the mTw air.

As shown on the east-west cross section (fig. 3), a flattening of the frontal (potential) surfaces caused subsidence and temporary clearing over Oklahoma. At the same time, as seen on the north-south cross section (fig. 4), unstable air was over the Dallas–Fort Worth, Tex., area and caused heavy precipitation in north central Texas, the warm, moist air continuing its northern trek.

The clearing, we find, for Texas is from a southwesterly direction; and the first clue is the ending of the rain along the Mexican border, near Del Rio, Tex., in particular.

By 7:30 p. m., November 23, the eastern part of the cold front in north Texas had moved to near Palestine, Tex., and the western portion to Del Rio, Tex. The cold air underrunning the warm air caused more rain all along the front, but not quite so heavy as in the afternoon and night of the 22d.

The cross section for November 23, 1940 (fig. 5), shows that a deepening of the cold air is occurring over the western portion of the east-west cross section and also over the north-south cross section (fig. 6), with cloud tops soaring high and rain increasing. The southerly winds over El Paso, Tex., changed to northerly in the lower levels during the night following this cross section, causing considerable rain in that area and to the eastward for the next 2 days.

The front that had advanced southeastward to central Arkansas extended southwestward to Del Rio, Tex., by the 1:30 a. m., E. S. T., map of November 24, 1940 (fig. 7a). This map is the turning point of the situation. As mentioned above, rapidly falling 3-hourly tendencies, usually over 1 mb., to the north or west of a point on a cold front portend a definitive wave formation. The fall of 2.4 mb. at Texarkana, Ark., is especially significant because the cold front changed to a warm front and moved northward. The 1:30 a. m. map of the 24th (fig. 7a) shows a continued definite inflow of the cold air to the west over the El Paso area, while the east-west cross section (fig. 7) shows a deepening of the cold air from the west and north to high levels.

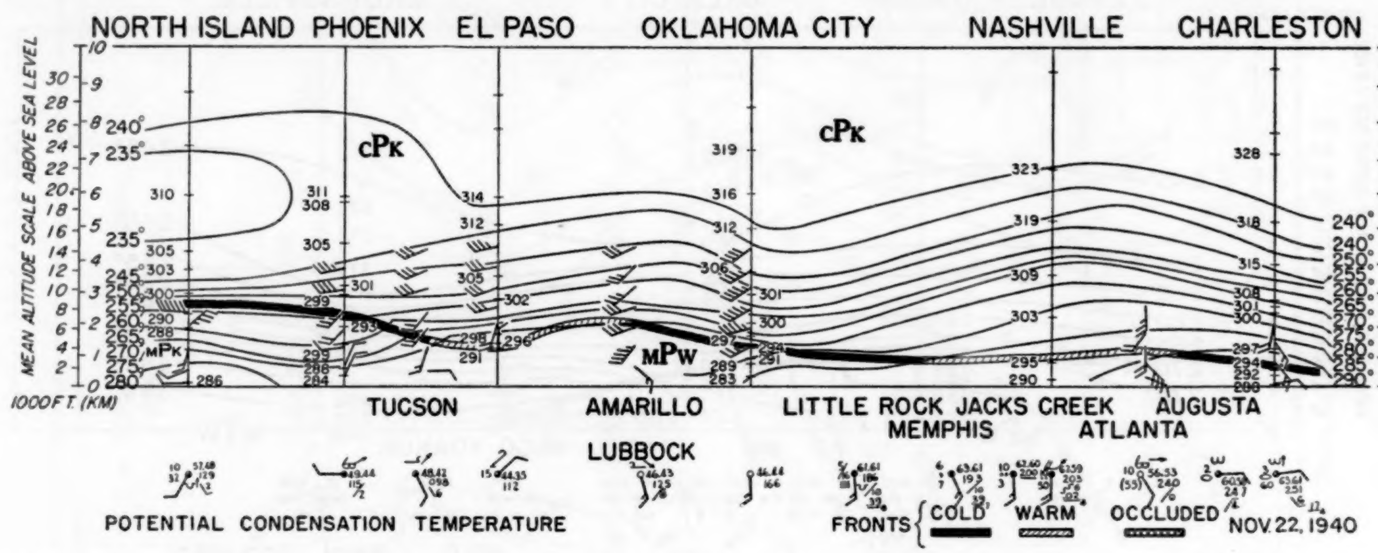


FIGURE 3.

It may be stated here that when a cold front tends to flatten out and become quasi-stationary over the Southern States, it should *never be ignored* for the reason that it may return as a warm front, sometimes generating a well-developed cyclone, as mentioned previously; this also holds true for the Gulf, and the regions along the southern Rockies.

By 1:30 a. m., E. S. T., November 23, 1940 (fig. 5a), the cold air that was over central Kansas on the 22d had advanced rapidly southward to the central Oklahoma area and was underrunning the warm air to the southward over West Texas. The large negative tendencies over Arkansas and Texas portended a movement of the front southward for the time being.

Norton (*op. cit.*) states with respect to a storm-center movement:

"Abnormal movements are indicated by the greatest fall being *north or west* of the center. If the storm has been blocked by a saddle for several days in Texas or the west Gulf region, then the old rule to look for a fall north of the center as indicating a breaking through, is a good one. In this case the storm increases in intensity and moves northeast, and clearing weather should be forecast as soon as a normal movement will carry the storm center from the district."

This deepening of the cold moist air continued, and the wave over East Texas on the 24th developed into a deepening wave by the 1:30 a. m., E. S. T., map of the 25th (fig. 8a); the cross section (fig. 8) shows still more deepening cold air to the westward. By the 1:30 a. m., E. S. T., map of November 26 (fig. 9), a strong cyclone had developed and moved northeastward to southern Missouri. The rain ended suddenly over Louisiana and Texas behind the center; clearing occurred over a wide arc from the southwest, and more slowly in Oklahoma and Arkansas due to an occluded front in that region.

In conclusion, it is to be emphasized that the upper-air conditions over the southwest are especially important

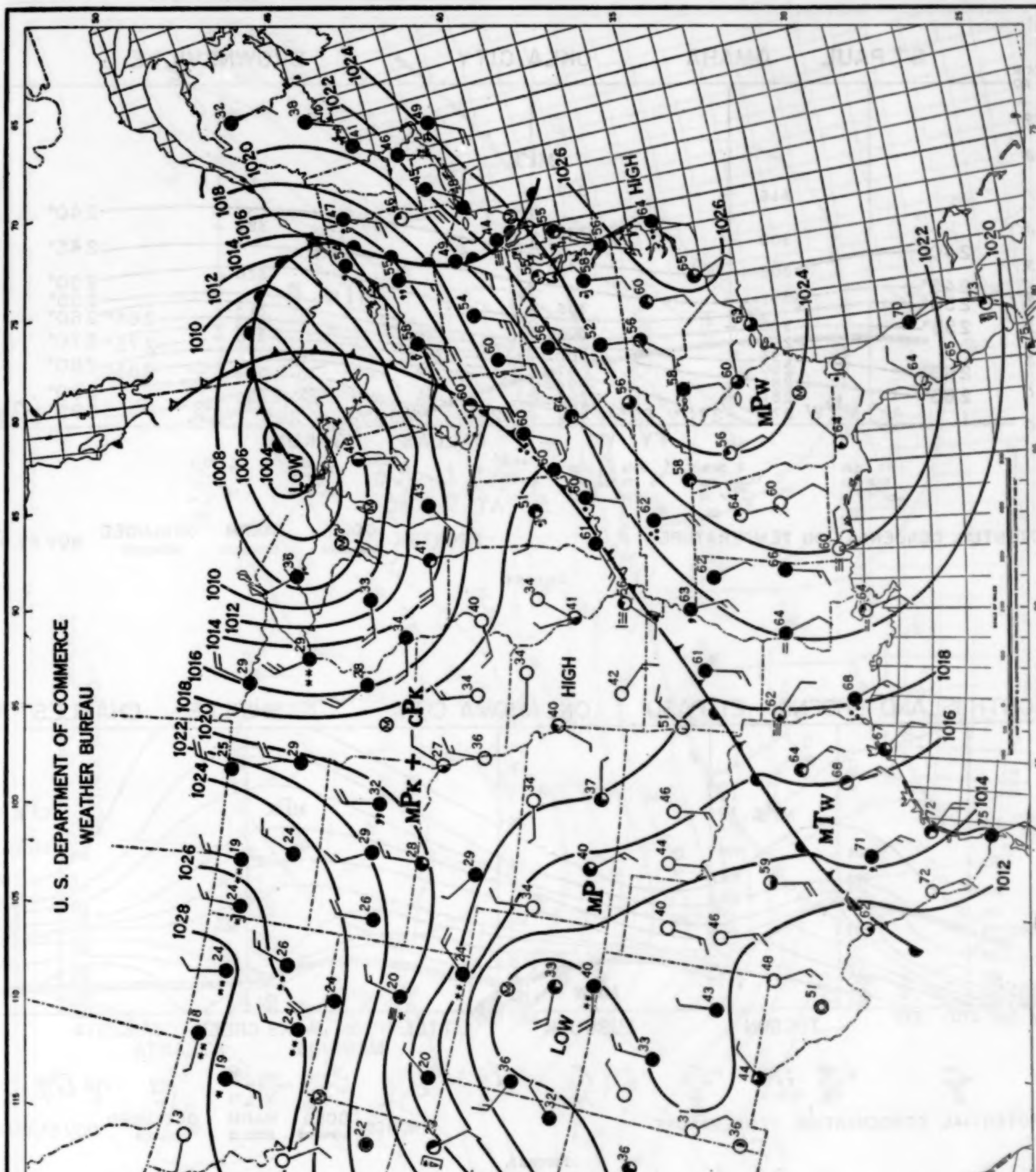


FIGURE 3a. 1:00 a. m., Nov. 22, 1910.

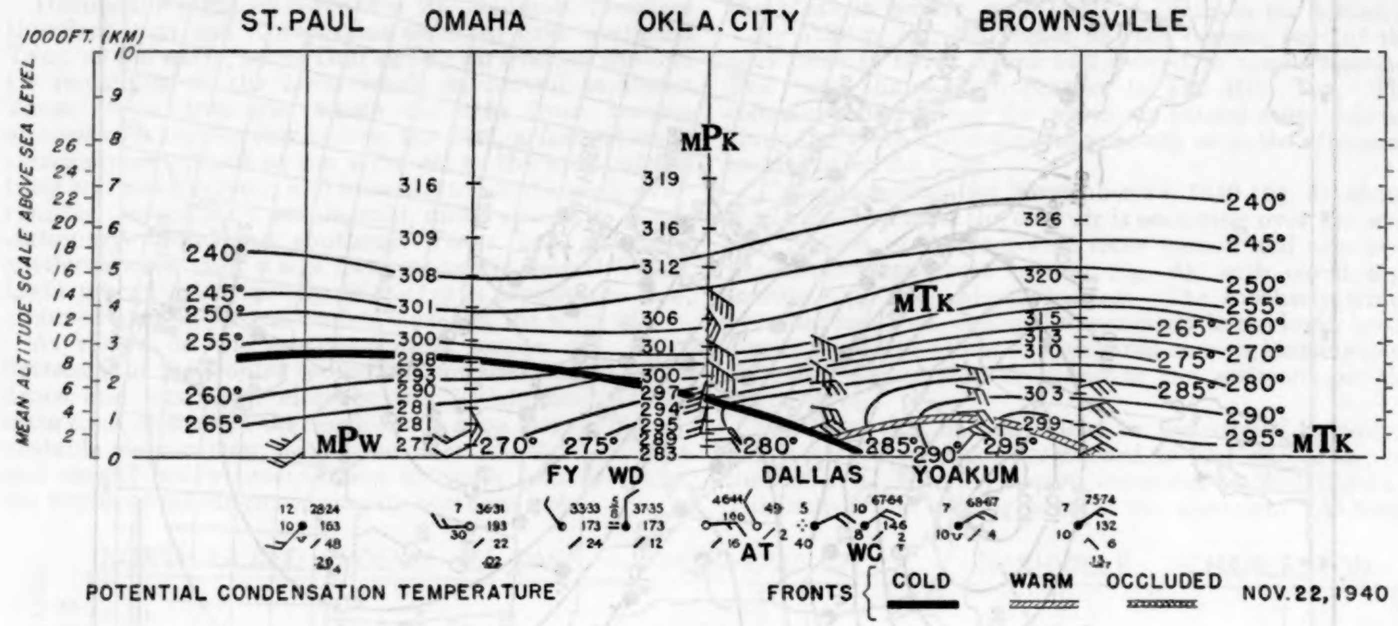


FIGURE 4.

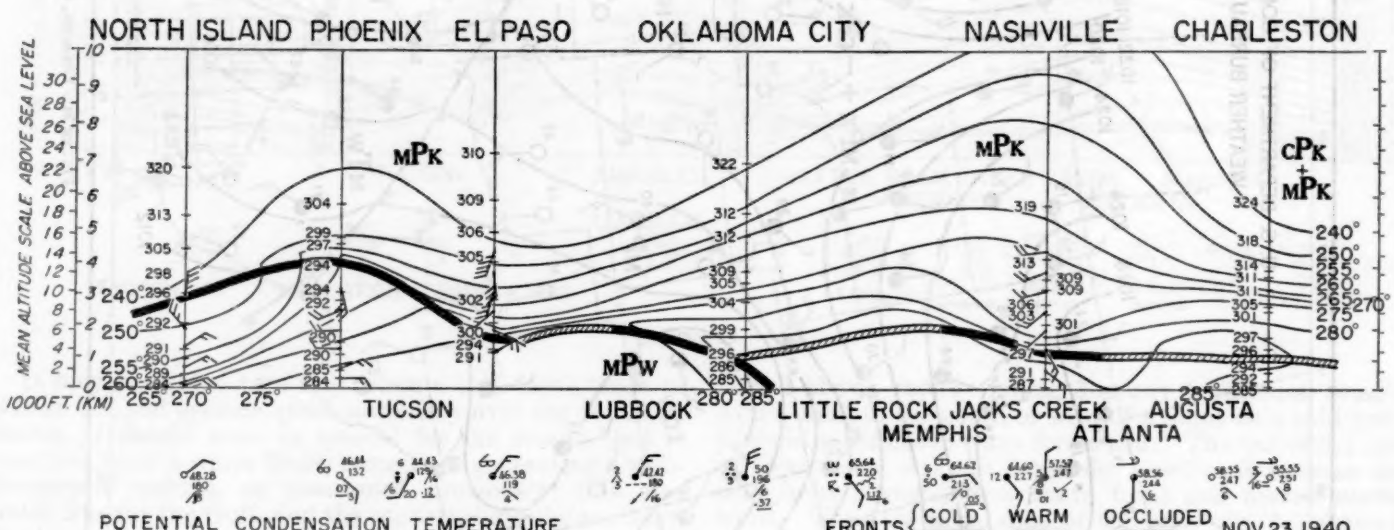


FIGURE 5.

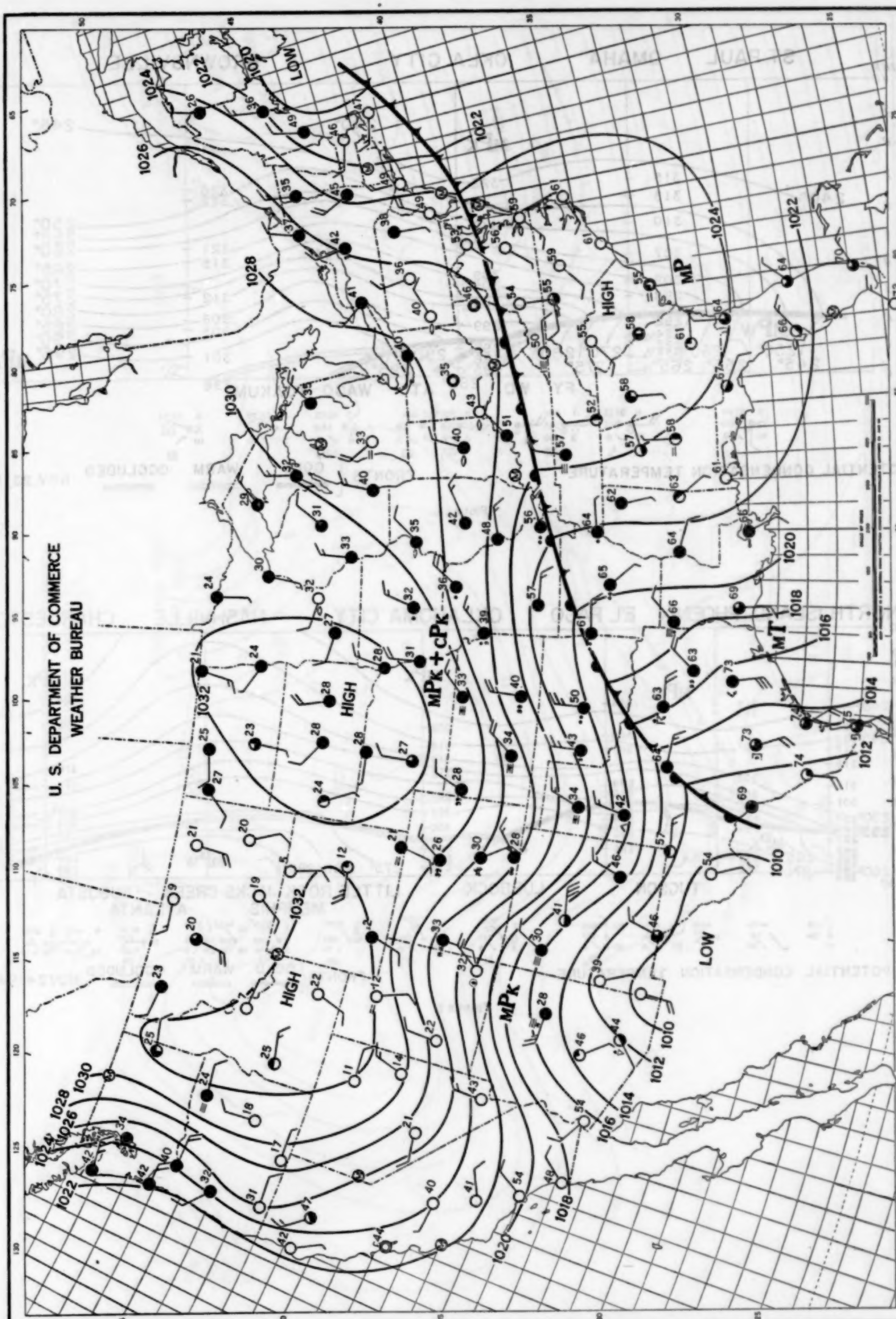


FIGURE 5a. 1:00 a. m., Nov. 23, 1940.

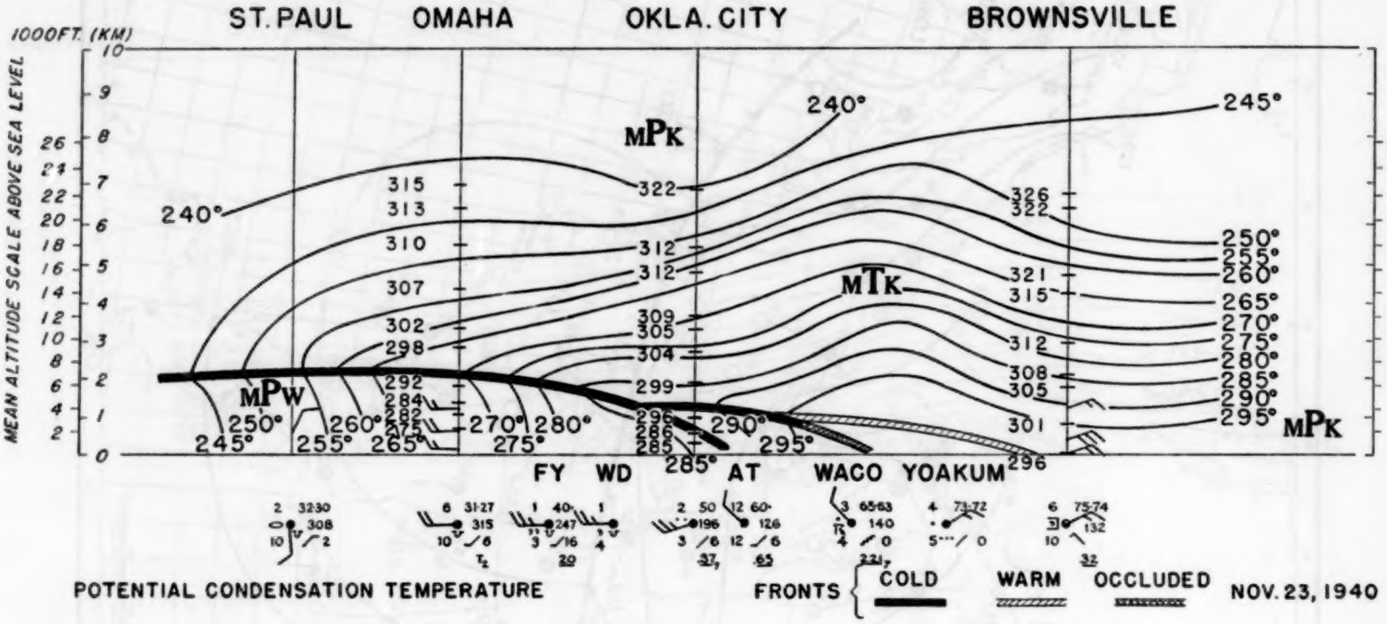


FIGURE 6.

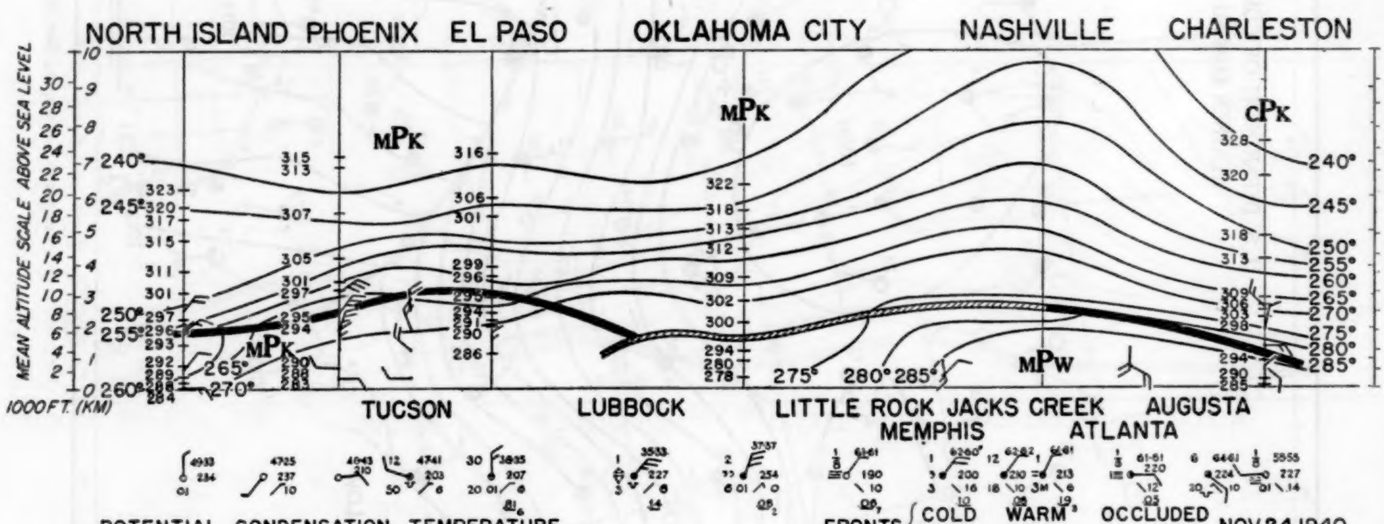


FIGURE 7.

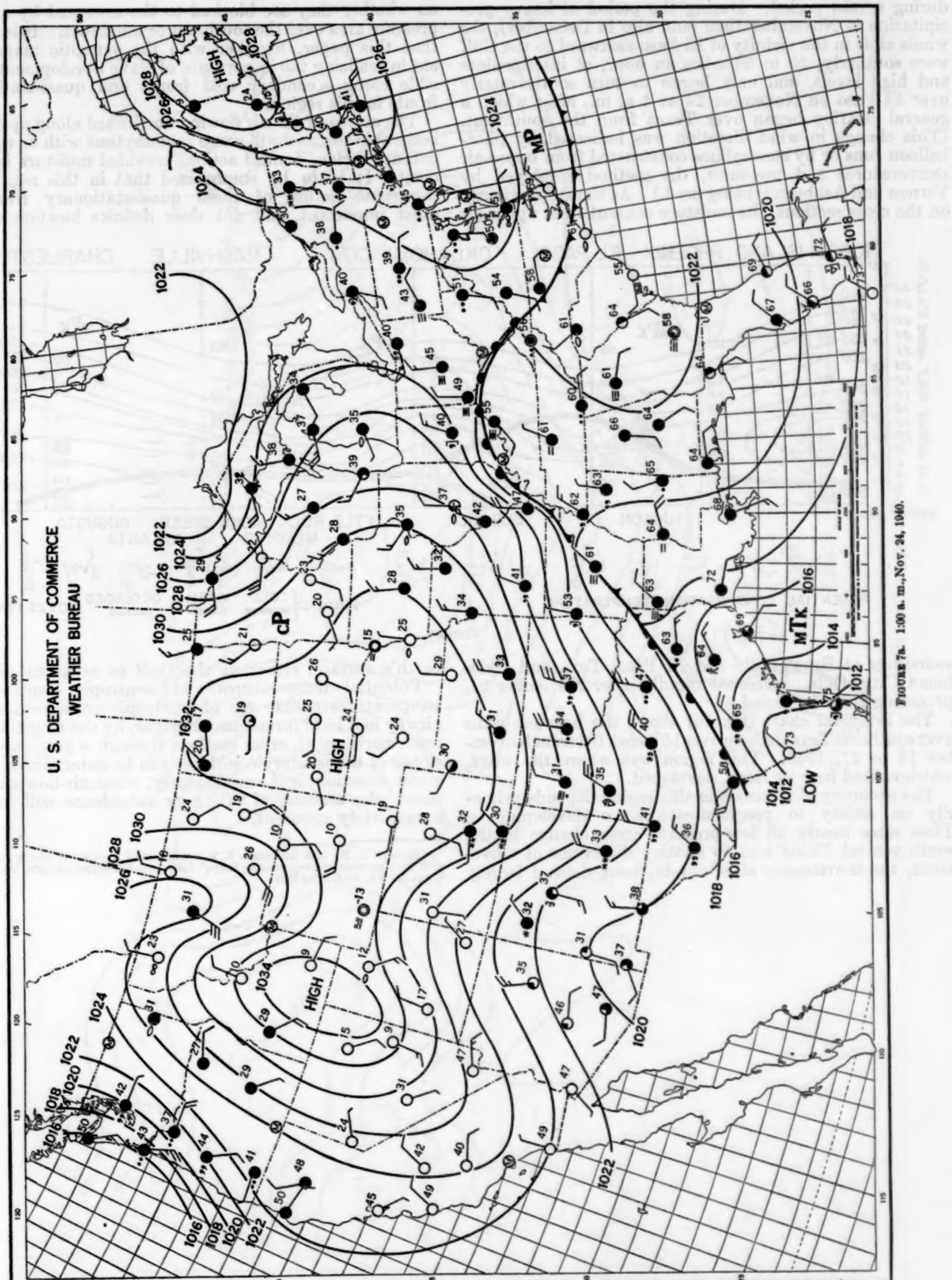


FIGURE 7b. 1:00 a. m., Nov. 24, 1940.

during a rain period. During the period of heavy precipitation in November 1940 (and also in December), the winds aloft in the vicinity of El Paso eastward to the Gulf were southerly, 30 to 50 miles an hour, at intermediate and high levels, and only began to turn southwesterly over El Paso on November 24 at 4 a. m., after which a general clearing began over Texas from the southwest. (This change in wind direction was indicated by pilot-balloon runs or by streamlines constructed from upper-air temperatures and pressures, the method employed by Vernon and Ashburn [11] being used.) As shown previously on the cross sections, the moisture content from upper-air on whether they are blocked to the eastward by a high-pressure area over the southeast or northeast. It is hoped that this paper, together with the synoptic maps, will aid in realizing the importance of wave developments possible along secondary cold fronts and quasi-stationary fronts in this region.

The action of the air flowing northward along upsloping isentropic surfaces will cause rain anytime with or without definite surface frontal action, provided moisture is sufficient. It is to be emphasized that in this region the isentropic nature of these quasi-stationary fronts is most important, and not their definite location at the

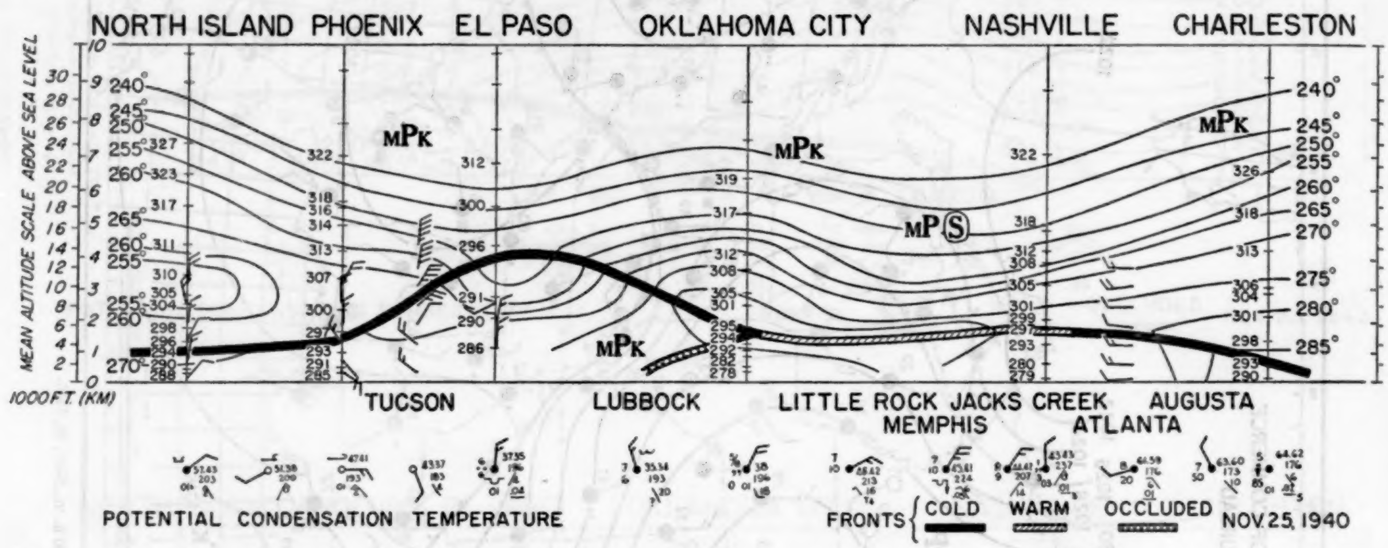


FIGURE 8.

soundings at Brownsville and El Paso, Tex., and Oklahoma City, Okla., increased rapidly after November 21, preceding the rain period.

The isohyetal chart (fig. 10) shows the heaviest rains over southeast Texas, where over 15 inches fell from November 18 to 27, 1940. This region was where the wave, which caused heavier rains, developed.

The accuracy of forecasts in this region depends primarily on ability to prognosticate wave developments. Then since nearly all low-pressure areas change in the south central Plains area to another directions of movement, the movements after development depend largely earth's surface, either in the Gulf or adjacent regions.

Potential temperatures and isentropic condensation temperatures enable use of isentropic cross sections for airway and local forecasts. Further, by drawing the east-west, north-south cross sections through a given area the slopes of the isentropic surfaces can be determined in any given direction; and consequently, when air-flow changes occur, the amount of lifting or subsidence will become immediately apparent.

[11] Vernon, E. N., and Ashbburn, E. V., "A practical method for computing winds aloft from pressure and temperature fields," MONTHLY WEATHER REVIEW, Vol. 66, No. 9, pp. 267-274, September 1938.

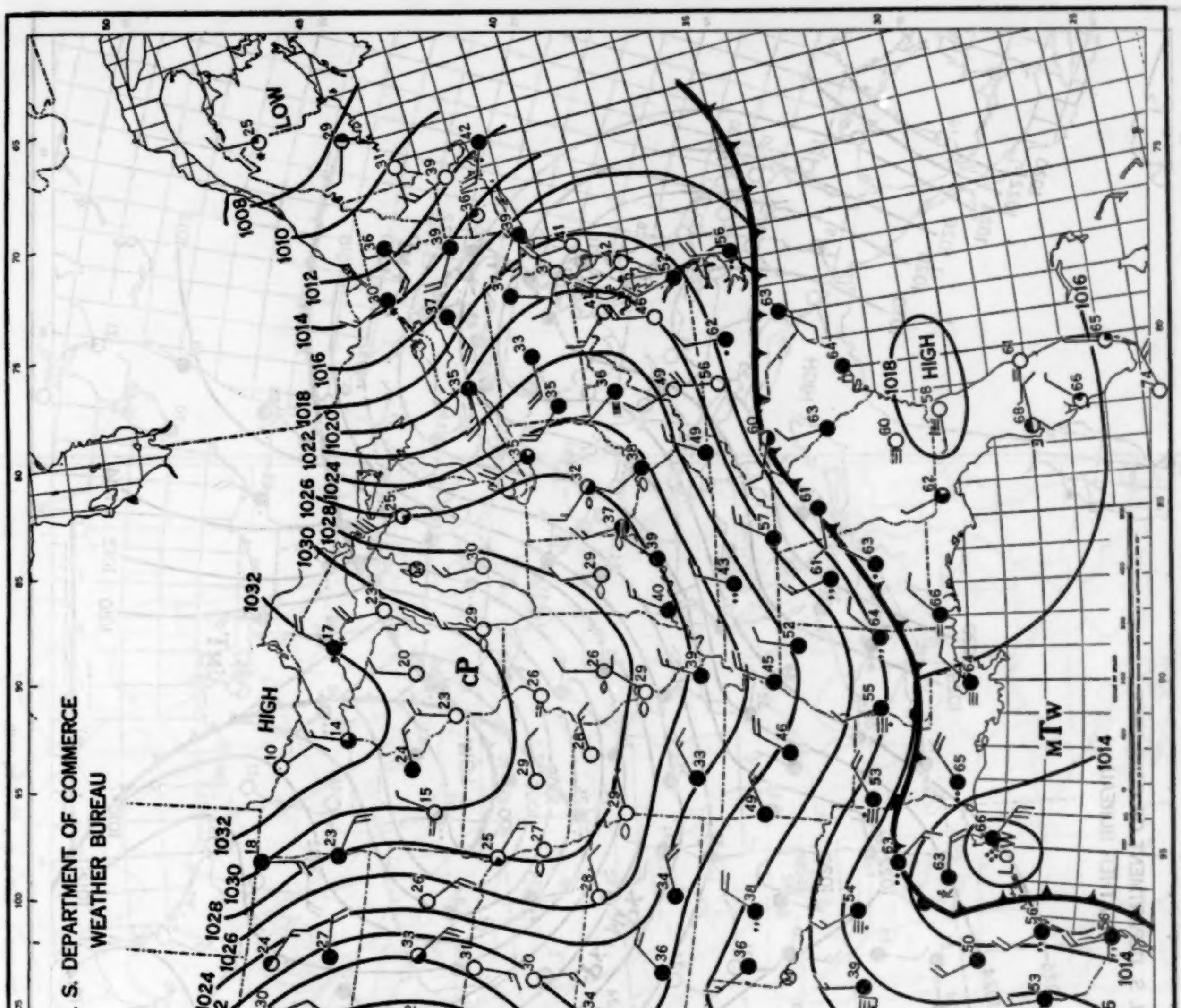


FIGURE 8a. 1:00 a. m., Nov. 25, 1940.

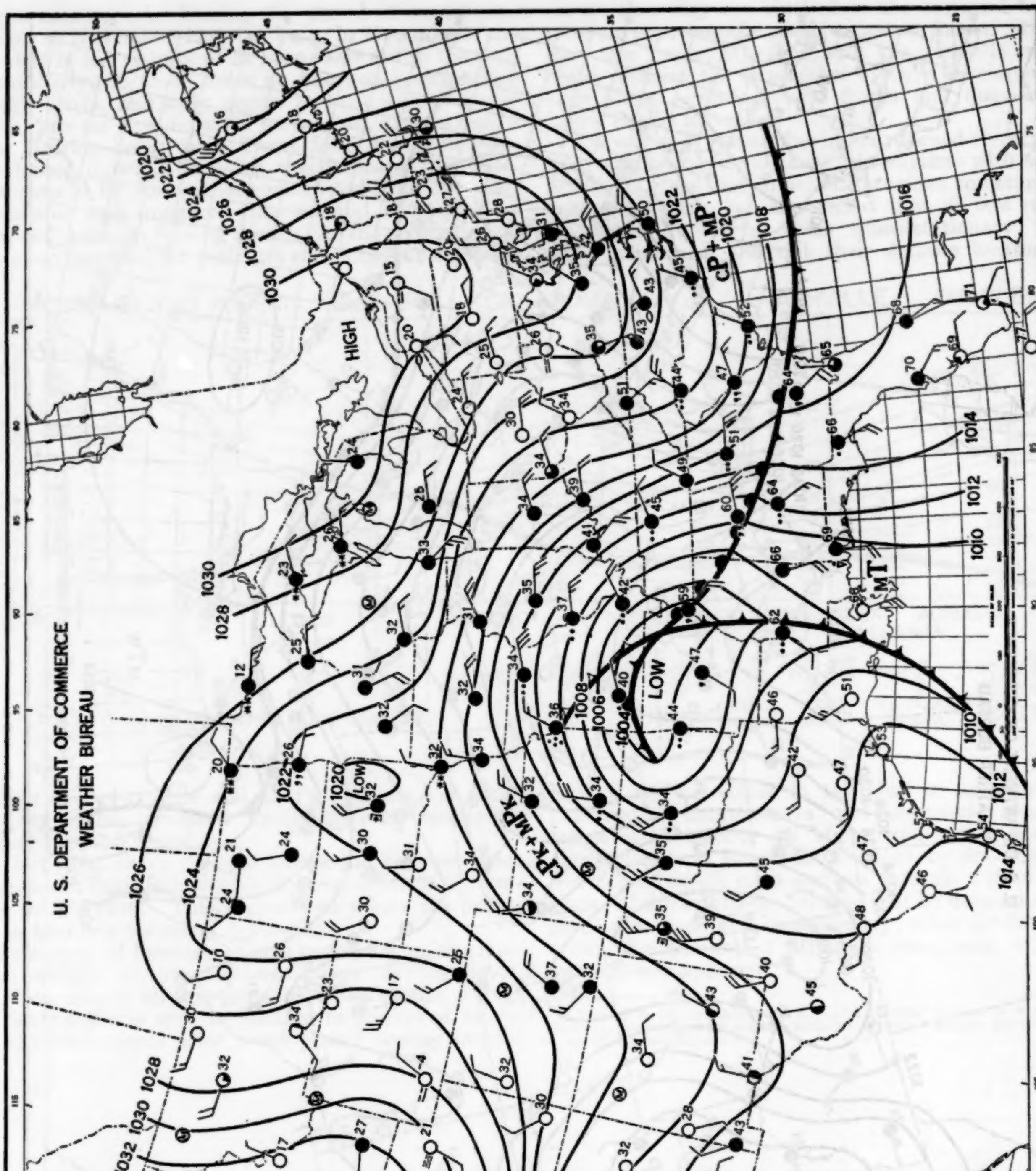


FIGURE 9. 1:00 a. m., Nov. 26, 1940.

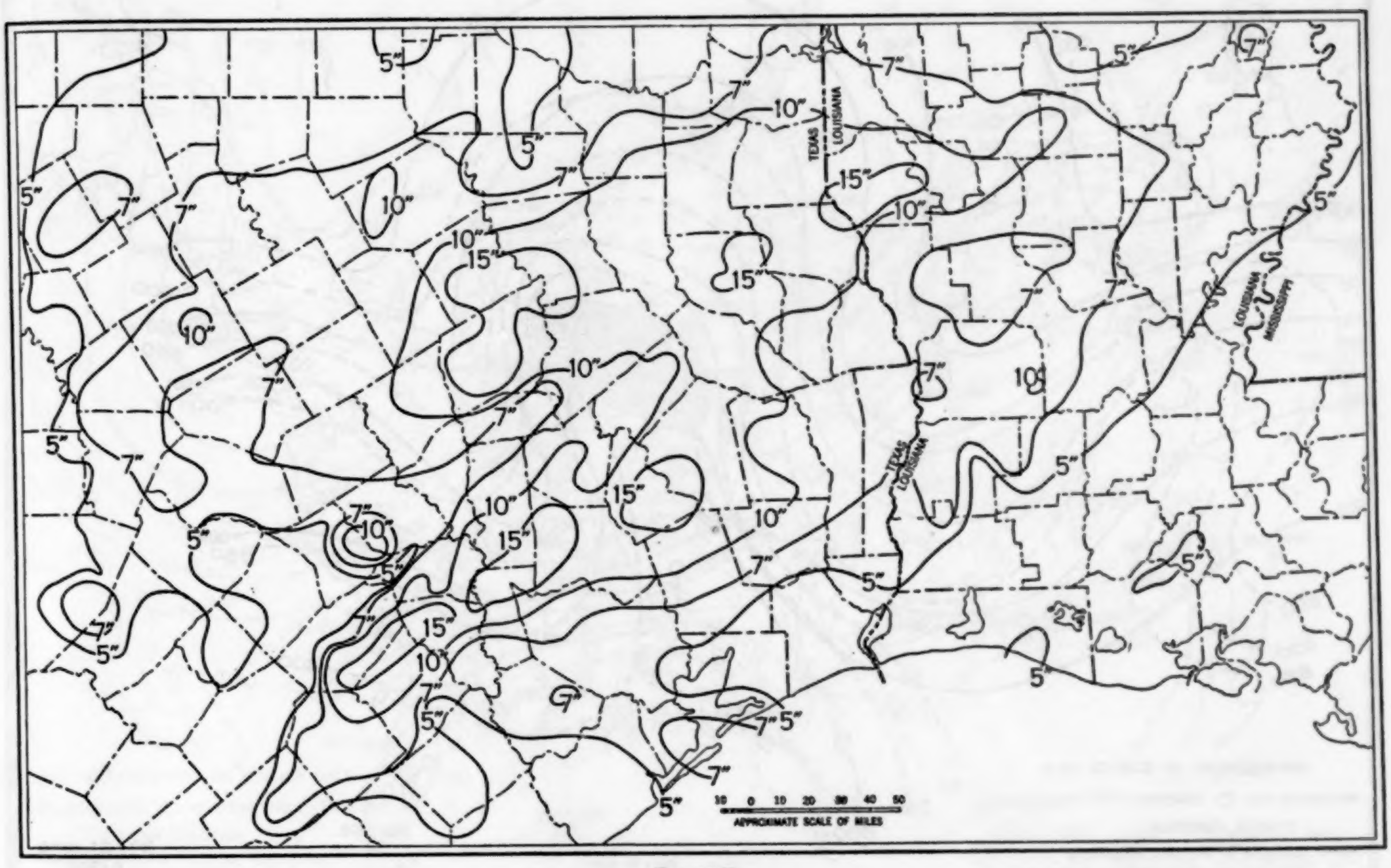

TEXAS
LOUISIANA
MISSISSIPPI
5"
7"
10"
15"
10 0 10 20 30 40 50
APPROXIMATE SCALE OF MILES

Figure 10.

MAP A1

U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU

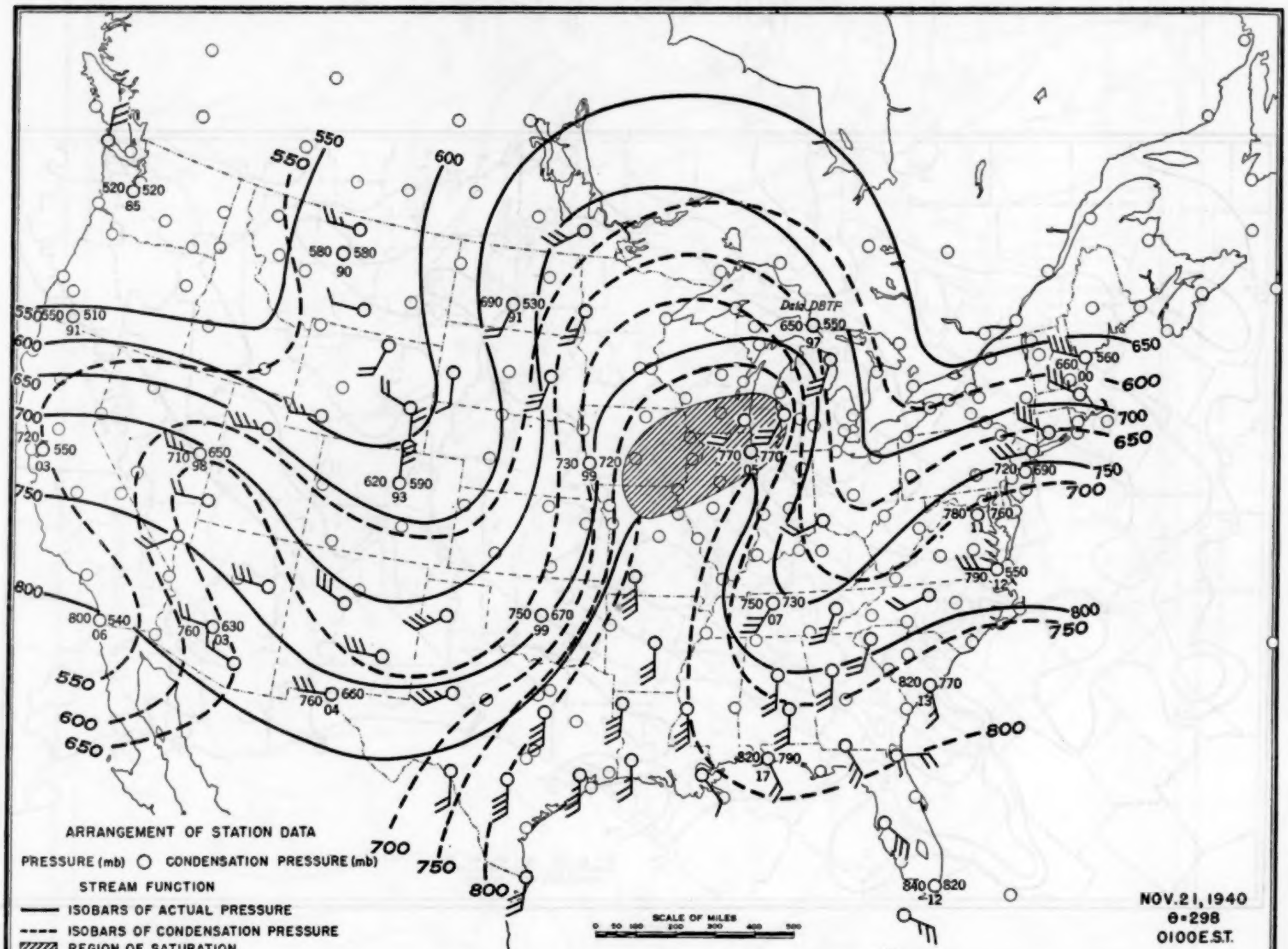


FIGURE 11.

MAP A1

U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU

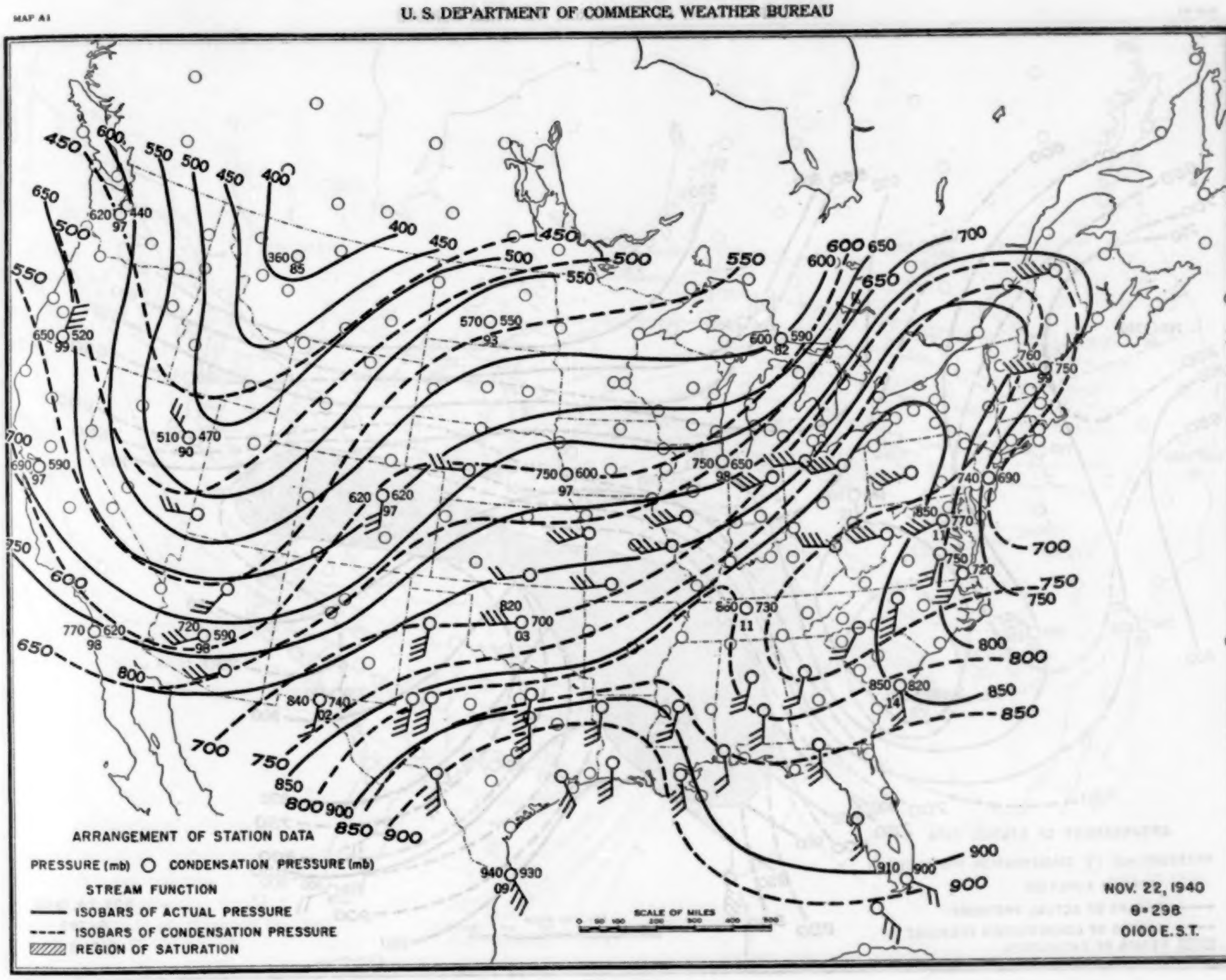


FIGURE 12.

MAP A1

U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU

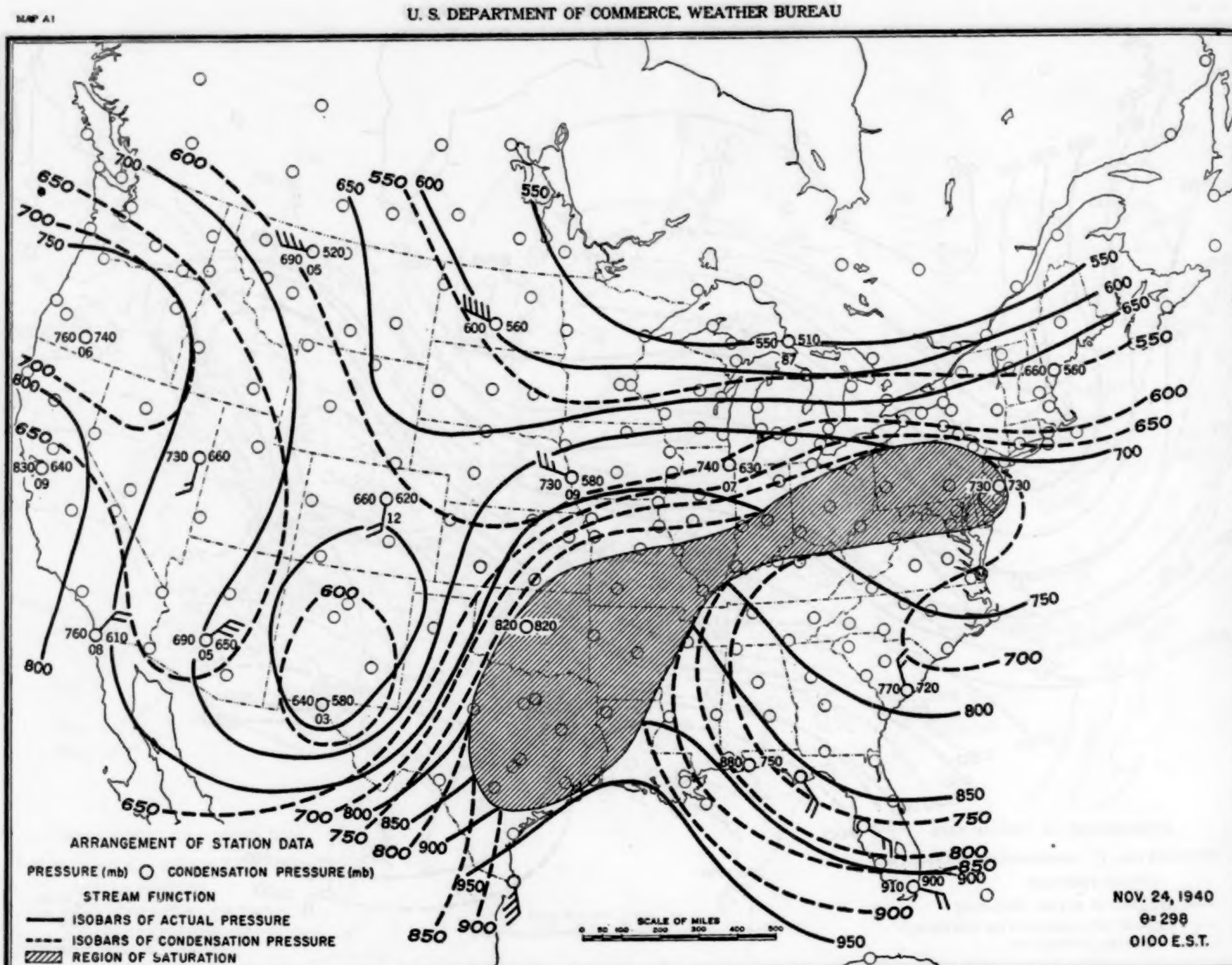


FIGURE 13.

MAP A1

U. S. DEPARTMENT OF COMMERCE, WEATHER BUREAU

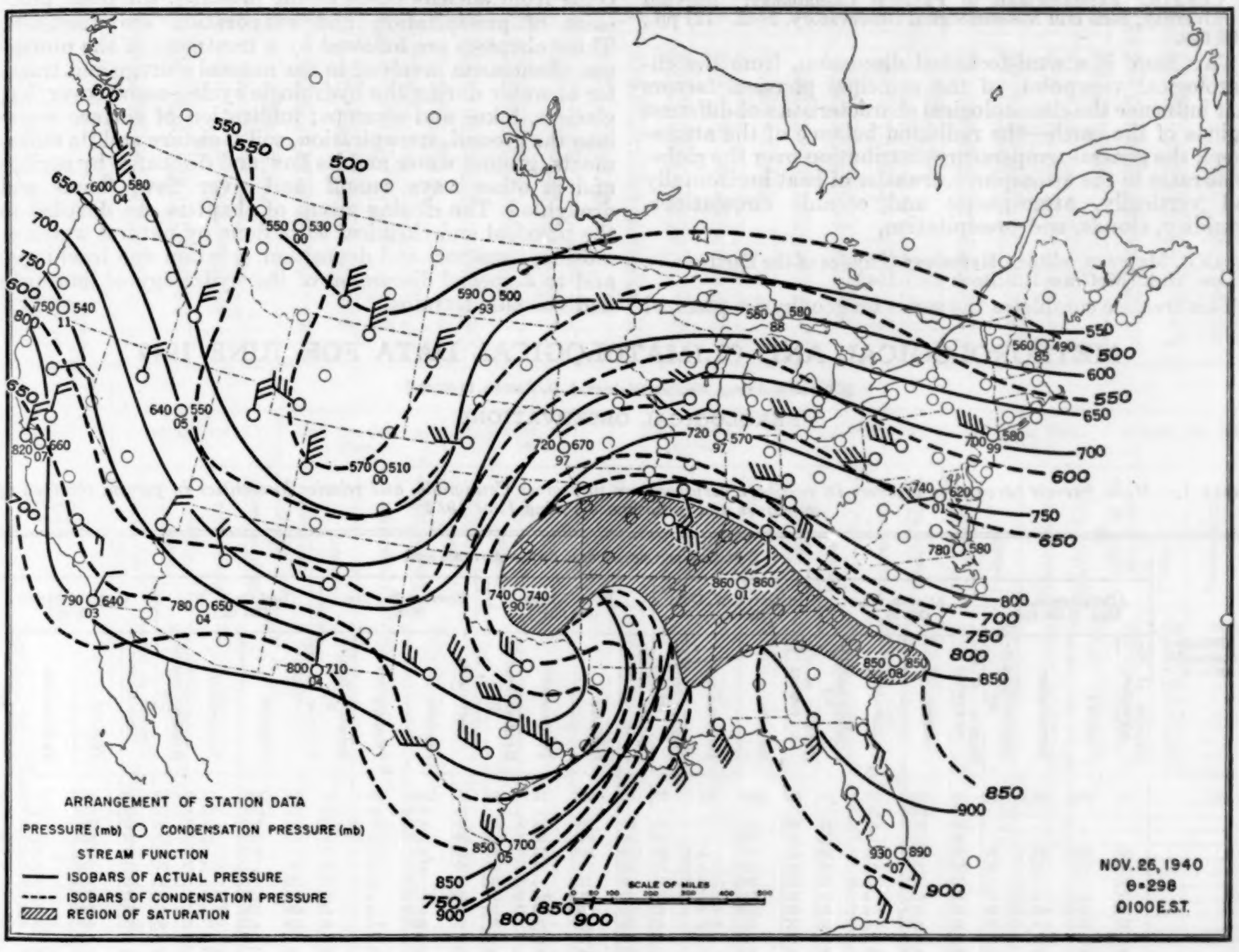


FIGURE 14.

NOTES AND REVIEWS

THOMAS A. BLAIR. **Weather Elements—A Text in Elementary Meteorology.** Revised Edition. New York (Prentice-Hall, Inc.), 1942.

The scope and character of this book are indicated in the review of the first edition that appeared in the MONTHLY WEATHER REVIEW for December 1937, p. 447.

This new edition represents a limited revision, in which numerous additions and modifications have been introduced without any change in the general character of the book.

V. CONRAD. **Fundamentals of Physical Climatology.** Harvard University, Blue Hill Meteorological Observatory, 1942. 121 pp., 60 figs.

This book is a semi-technical discussion, from the climatological viewpoint, of the principal physical factors that influence the climatological characteristics of different regions of the earth—the radiation balance of the atmosphere, the general temperature distribution over the globe, lapse rates in the atmosphere, transfer of heat horizontally and vertically, atmospheric and oceanic circulations, humidity, clouds, and precipitation.

OSCAR E. MEINZER, editor. **Hydrology** (Physics of the Earth—IX). New York (McGraw Hill Book Co.) 1942.

This treatise completes the series on geophysics planned in 1926 by the National Research Council, the earliest volumes of which were published in 1931. The volume on Hydrology has been in preparation since 1936, and is the work of 24 authors; it fills 712 large pages, and includes many diagrams and photographs, and extensive bibliographic lists.

All phases of the hydrologic cycle are covered. After an introductory chapter (which includes an interesting section on the historical development of hydrologic concepts from ancient times to the present), the basic processes of precipitation and evaporation are discussed. These chapters are followed by a treatment of the numerous phenomena involved in the natural storage and transfer of water during the hydrologic cycle—snow cover, ice, glaciers, lakes and swamps; infiltration of surface water into the ground, transpiration, soil moisture and its movements, ground water and its flow and discharge by springs and in other ways, runoff and river flow, floods and droughts. The closing group of chapters are devoted to the physical and chemical work done by natural waters—erosion, transport and deposition, solution and leaching—and to a special discussion of the hydrology of limestone and volcanic terrains.

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR JUNE 1942

[Climate and Crop Weather Division, J. B. KINCER, in charge]

AEROLOGICAL OBSERVATIONS

TABLE 1.—*Mean free-air barometric pressure in millibars, termperature in degrees Centigrade, and relative humidities in percent obtained by airplanes and radiosondes during June 1942*

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level: Albuquerque, N. Mex. (1,620 m.)				Atlanta, Ga. (300 m.)				Bismarck, N. Dak. (505 m.)				Boise, Idaho (864 m.)				Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Caribou, Maine (191 m.)			
	Number of observations	Pressure	Temperature	Realtive humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Realtive humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	835	24.4	22	30	981	23.2	80	30	953	15.7	76	30	914	17.9	49	29	1010	26.6	86	29	989	17.4	82	27	990	14.8	82
500					30	959	23.4	76									29	955	24.5	82	29	958	18.4	72	27	954	15.9	71
1,000					30	906	20.9	75	30	899	14.6	69	30	899	19.0	46	29	902	23.2	63	29	903	15.9	68	27	900	13.5	67
1,500					30	855	17.9	73	30	847	11.5	70	30	848	16.1	42	29	852	21.0	55	29	852	12.6	71	27	848	10.6	66
2,000	30	800	24.2	20	30	806	14.9	69	30	797	8.3	67	30	800	12.0	43	29	804	18.2	51	29	802	9.9	68	27	798	7.4	67
2,500	30	755	20.6	20	30	759	11.8	68	30	750	5.5	61	30	753	7.8	47	29	758	15.3	48	29	755	7.5	61	27	751	4.5	69
3,000	30	712	16.6	20	30	715	8.9	64	30	706	2.8	55	30	708	4.0	50	29	714	12.1	45	29	710	5.1	55	27	706	1.5	72
4,000	30	632	7.9	22	30	633	3.1	61	30	623	−3.0	50	30	625	−3.3	56	29	633	6.1	43	29	628	−0.1	46	27	623	−3.8	63
5,000	30	558	−0.8	24	29	559	−2.7	59	29	548	−9.5	47	30	550	−9.7	53	28	560	0.2	40	29	554	−5.7	42	27	548	−9.9	58
6,000	30	492	−8.7	27	29	492	−8.6	56	27	481	−16.1	45	28	482	−16.1	51	28	494	−6.0	40	29	487	−11.8	40	25	481	−16.6	53
7,000	30	432	−15.4	26	29	432	−14.8	53	27	420	−23.2	44	28	422	−22.8	49	28	434	−12.5	39	28	426	−18.5	36	24	420	−23.6	50
8,000	30	377	−22.2	24	28	378	−21.5	51	27	366	−30.5	43	27	367	−30.1	48	27	380	−19.2	38	28	372	−25.7	35	24	365	−30.8	49
9,000	30	328	−29.7	22	28	329	−28.7	49	27	316	−38.1	42	24	318	−37.4	47	27	331	−26.2	38	28	323	−32.5	35	24	316	−37.7	47
10,000	30	286	−37.4		27	286	−36.3	48	27	273	−44.8		24	275	−43.9		27	288	−33.4	38	27	280	−39.3	36	24	273	−44.8	
11,000	29	246	−45.0		27	247	−44.1		27	235	−50.1		21	236	−49.6		27	249	−40.8		26	242	−45.7		23	235	−50.4	
12,000	29	212	−51.6		27	212	−51.7		26	201	−53.3		20	202	−52.8		27	215	−48.1		23	208	−51.6		23	201	−53.2	
13,000	29	181	−57.1		27	182	−58.5		25	172	−54.2		19	174	−54.0		27	185	−54.8		22	178	−56.5		23	172	−55.5	
14,000	28	154	−60.5		27	154	−63.3		25	147	−54.9		17	148	−54.6		26	157	−61.0		20	151	−60.4		21	146	−56.3	
15,000	27	131	−63.2		27	131	−65.9		24	126	−54.9		17	127	−55.4		25	134	−67.2		18	129	−61.0		19	125	−57.7	
16,000	25	112	−65.9		25	111	−67.7		21	108	−55.6		15	108	−56.4		25	113	−72.8		15	110	−61.4		17	106	−57.7	
17,000	24	94	−67.2		23	94	−67.9		15	92	−56.4		14	92	−57.0		23	95	−76.9		15	93	−61.2		14	90	−57.5	
18,000	23	80	−66.3		20	80	−65.4		12	78	−56.2		10	79	−57.4		21	80	−76.3		13	79	−60.3		10	76	−55.6	
19,000	17	68	−61.7		11	68	−61.9		6	67	−55.2		7	67	−56.7		17	68	−72.4		8	67	−58.9					
20,000	11	58	−58.1														10	57	−67.6									
21,000	7	49	−55.2														8	48	−63.2									

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during June 1942*—Continued

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																											
	Charleston, S. C. (14 m.)				Denver, Colo. (1,616 m.)				Detroit, Mich. (194 m.)				El Paso, Tex. (1,193 m.)				Ely, Nev. (1,908 m.)				Great Falls, Mont. (1,128 m.)				Huntington, W. Va. (172 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,014	23.6	92	30	837	16.4	68	30	991	17.4	87	30	878	28.7	22	30	807	16.1	29	30	886	12.8	69	30	994	20.7	89
500	30	960	22.7	80	----	----	----	----	30	956	18.8	67	----	----	----	----	----	----	----	----	----	----	----	----	30	957	21.2	74
1,000	30	906	20.0	75	----	----	----	----	30	902	16.5	68	----	----	----	----	----	----	----	----	----	----	----	----	30	904	18.6	71
1,500	30	855	17.1	74	----	----	----	----	30	850	13.7	67	30	848	28.4	22	----	----	----	----	30	848	11.9	62	30	852	15.4	75
2,000	30	806	14.2	71	30	800	16.2	61	30	801	11.0	64	30	801	25.0	22	30	799	17.2	29	30	798	8.5	62	30	803	12.6	73
2,500	30	759	11.2	66	30	754	13.4	58	30	754	8.4	59	30	756	20.8	22	30	753	14.7	29	30	751	5.0	66	30	756	9.8	69
3,000	30	715	8.5	62	30	710	10.2	59	30	709	5.7	56	30	713	16.7	22	30	710	10.5	30	30	706	1.4	70	30	712	7.5	63
4,000	30	633	2.9	59	30	629	3.4	59	29	627	0.2	50	30	633	8.4	24	30	628	2.3	34	30	623	−4.8	69	29	630	2.1	60
5,000	30	559	−2.7	57	30	555	−4.4	59	29	553	−5.8	49	30	560	0.1	28	30	554	−5.7	36	30	548	−11.5	62	27	556	−3.3	59
6,000	30	492	−8.2	53	30	488	−12.0	55	28	486	−11.3	43	29	493	−7.4	32	30	487	−13.1	37	30	480	−18.4	58	25	490	−9.3	55
7,000	28	432	−14.5	53	29	427	−19.2	52	28	426	−17.9	41	29	433	−14.0	32	30	427	−20.1	35	30	419	−25.5	54	25	430	−15.6	53
8,000	25	378	−21.2	52	29	373	−26.4	46	28	372	−25.0	40	29	379	−20.6	28	30	372	−28.1	34	29	364	−32.9	54	25	375	−22.5	50
9,000	23	329	−28.4	51	26	324	−33.9	45	28	324	−32.0	38	29	330	−28.1	26	29	322	−35.6	34	29	315	−39.7	----	25	326	−29.7	48
10,000	22	286	−36.2	50	25	280	−41.6	----	27	280	−39.5	39	28	287	−35.8	24	28	279	−42.7	----	29	272	−45.9	----	24	283	−37.3	40
11,000	21	247	−43.8	----	25	241	−49.0	----	27	242	−46.4	----	28	248	−43.4	----	28	240	−48.8	----	29	234	−50.2	----	24	244	−45.2	----
12,000	21	212	−51.0	----	23	207	−55.5	----	27	207	−52.8	----	27	213	−50.4	----	27	206	−53.7	----	28	200	−52.4	----	24	210	−52.3	----
13,000	21	182	−57.7	----	23	176	−59.2	----	26	177	−58.2	----	26	182	−55.5	----	25	176	−57.5	----	28	172	−52.1	----	24	180	−58.6	----
14,000	21	155	−62.3	----	22	150	−61.0	----	25	151	−61.7	----	25	156	−60.2	----	22	150	−59.5	----	27	147	−52.1	----	24	153	−63.2	----
15,000	20	131	−65.7	----	22	128	−63.0	----	24	129	−60.6	----	25	133	−64.1	----	21	127	−61.2	----	27	126	−52.8	----	24	130	−64.5	----
16,000	20	112	−67.7	----	22	109	−64.6	----	19	109	−61.6	----	24	112	−67.8	----	20	109	−62.4	----	27	108	−53.9	----	23	110	−65.2	----
17,000	19	94	−67.6	----	19	92	−64.6	----	17	93	−62.1	----	23	95	−70.4	----	19	92	−63.4	----	26	92	−54.6	----	18	93	−64.8	----
18,000	11	80	−66.8	----	15	78	−62.0	----	13	79	−61.0	----	17	80	−69.2	----	16	78	−62.1	----	19	79	−54.3	----	16	79	−63.8	----
19,000	----	----	----	----	8	67	−60.6	----	5	68	−59.5	----	14	68	−65.4	----	6	66	−60.7	----	13	68	−53.7	----	11	67	−62.2	----
20,000	----	----	----	----	----	----	----	----	----	----	----	----	8	58	−60.5	----	----	----	----	----	5	58	−53.4	----	5	57	−59.8	----

Altitude (meters) m.s.l.	Stations and elevations in meters above sea level																											
	Joliet, Ill. (178 M.)				Lake Charles, La. (6 m.)				Lakehurst, N. J.[1] (39 m.)				Medford, Oreg. (401 m.)				Miami, Fla. (4 M.)				Nashville, Tenn. (180 m.)				Norfolk, Va.[1] (4 m.)			
	Number of observations	Pressure	Temperature	Realtive humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Realtive humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	28	994	19.0	84	29	1,012	25.0	90	30	1,011	19.0	82	30	968	19.3	49	30	1,016	25.2	89	30	993	23.9	72	29	1,016	23.2	81
500	28	957	20.0	75	29	956	23.5	78	30	959	18.8	64	30	957	18.8	49	30	960	23.3	86	30	957	23.8	67	29	960	21.7	70
1,000	28	903	17.6	74	29	903	21.5	67	30	905	16.5	59	30	902	15.7	50	30	906	20.4	78	30	904	21.1	66	29	906	19.2	66
1,500	28	852	14.7	73	29	853	19.1	62	30	853	13.8	62	30	850	12.0	56	30	855	17.5	75	30	853	17.9	71	29	855	16.1	67
2,000	28	802	12.1	69	28	804	16.4	55	30	803	11.2	60	30	800	8.3	66	30	806	14.7	72	30	804	15.1	71	29	806	13.4	66
2,500	28	756	9.6	62	28	758	13.8	49	30	756	8.7	57	30	753	5.3	67	30	760	11.8	69	30	758	12.1	68	29	759	10.8	60
3,000	28	711	7.0	58	28	714	10.8	49	30	712	6.0	52	30	709	2.8	62	30	716	9.0	68	30	714	9.2	65	29	715	8.3	58
4,000	28	630	1.4	53	28	632	4.8	50	30	629	1.2	46	29	626	−2.5	49	29	634	2.9	67	30	633	3.4	64	29	633	2.5	53
5,000	28	556	−4.5	56	27	559	−1.2	47	30	555	−4.5	44	28	551	−8.5	48	29	560	−2.5	68	30	559	−2.4	60	27	558	−3.3	44
6,000	27	488	−10.8	54	27	492	−7.5	43	30	488	−10.2	38	27	484	−14.8	46	29	493	−7.9	67	30	492	−8.0	56	27	491	−8.9	45
7,000	27	429	−17.5	52	26	432	−13.9	39	30	428	−16.6	35	27	424	−21.6	44	27	433	−13.8	66	30	432	−14.1	53	27	431	−15.3	46
8,000	26	374	−24.4	51	26	378	−20.8	36	30	374	−23.6	34	26	368	−28.8	43	26	379	−20.3	63	29	378	−20.9	51	----	----	----	----
9,000	26	325	−31.5	50	25	329	−27.9	35	30	325	−30.7	33	26	320	−35.8	43	25	330	−27.4	63	29	329	−27.8	50	----	----	----	----
10,000	26	282	−38.8	48	25	286	−35.4	36	30	283	−38.3	----	24	277	−42.5	----	25	287	−35.0	62	27	286	−35.3	48	----	----	----	----
11,000	26	243	−46.0	----	24	247	−42.9	----	29	244	−45.8	----	24	238	−48.9	----	24	248	−42.8	----	26	248	−43.2	----	----	----	----	----
12,000	25	208	−52.7	----	23	213	−50.3	----	29	210	−53.0	----	24	204	−53.5	----	23	213	−50.7	----	26	213	−50.8	----	----	----	----	----
13,000	25	178	−58.2	----	22	182	−57.1	----	29	179	−59.2	----	24	174	−54.8	----	23	183	−57.5	----	26	182	−57.8	----	----	----	----	----
14,000	25	152	−61.3	----	20	155	−62.6	----	25	153	−62.5	----	23	149	−55.3	----	23	156	−63.3	----	26	155	−62.7	----	----	----	----	----
15,000	24	129	−61.9	----	18	131	−67.4	----	16	130	−61.7	----	21	128	−55.4	----	22	132	−68.1	----	25	132	−65.1	----	----	----	----	----
16,000	24	110	−62.3	----	17	111	−72.0	----	9	110	−63.1	----	20	109	−56.2	----	22	112	−70.8	----	25	112	−66.9	----	----	----	----	----
17,000	21	93	−62.5	----	16	93	−74.0	----	5	93	−63.4	----	19	93	−56.9	----	18	94	−70.0	----	23	95	−67.2	----	----	----	----	----
18,000	18	79	−60.5	----	14	78	−71.8	----	----	----	----	----	15	80	−56.6	----	11	80	−67.4	----	20	80	−66.0	----	----	----	----	----
19,000	15	68	−59.1	----	6	66	−68.1	----	----	----	----	----	6	68	−56.2	----	8	68	−64.2	----	17	68	−64.0	----	----	----	----	----
20,000	5	57	−57.5	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	15	58	−61.5	----	----	----	----	----
21,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	6	50	−59.7	----	----	----	----	----

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent obtained by airplanes and radiosondes during June 1942*—Continued

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																											
	Oakland, Calif. (2 m.)				Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (301 m.)				Pensacola, Fla.[1] (24 m.)				Phoenix, Ariz. (339 m.)				Portland, Maine, (20 m.)				St. Louis, Mo. (171 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,013	16.0	74	30	966	23.2	81	30	978	20.9	77	26	1,012	26.0	80	30	967	29.3	21	30	1,012	14.2	91	30	994	21.8	82
500	30	956	16.5	63	30	954	23.3	77	30	956	21.2	72	26	958	23.1	69	30	950	33.1	18	30	956	16.8	71	30	956	22.1	71
1,000	30	902	18.2	38	30	901	21.8	72	30	902	19.1	69	26	905	20.2	65	30	898	30.5	17	30	902	14.8	73	30	903	19.3	70
1,500	30	850	16.0	32	30	851	19.0	71	30	852	16.0	71	26	854	17.4	62	30	849	26.4	16	30	850	11.9	75	30	852	16.3	72
2,000	30	801	13.8	29	30	802	16.8	64	30	802	13.2	68	26	805	14.7	57	30	802	22.1	16	30	800	9.1	75	30	803	14.1	63
2,500	30	755	11.0	27	30	756	14.5	56	30	756	10.8	64	26	758	11.8	53	30	756	17.9	16	30	753	6.2	69	30	756	11.4	59
3,000	30	710	8.1	26	30	713	11.9	52	30	712	8.2	58	26	714	8.7	50	30	713	14.1	17	30	709	3.4	68	30	712	8.7	58
4,000	30	629	2.5	25	30	632	5.4	51	30	630	2.4	52	24	632	2.3	48	30	632	7.5	17	27	626	−2.5	61	30	631	3.0	59
5,000	30	555	−3.4	24	27	559	−1.3	46	30	556	−4.1	52	22	558	−3.4	49	29	559	0.8	17	25	551	−8.3	53	30	557	−3.2	59
6,000	30	488	−9.9	23	27	492	−8.0	44	28	489	−10.4	50	21	490	−9.0	48	29	493	−6.3	17	22	484	−14.9	51	28	490	−9.3	54
7,000	28	428	−17.1	23	27	432	−14.7	44	28	429	−17.3	49	20	431	−14.9	39	29	433	−13.4	16	19	424	−21.2	52	28	430	−15.7	49
8,000	27	374	−24.9	23	27	377	−21.8	41	28	374	−24.3	46	15	377	−22.1	35	29	379	−21.2	16	17	368	−28.6	54	28	376	−22.6	47
9,000	27	324	−32.3	23	27	328	−29.1	39	28	325	−31.8	45	13	327	−29.8	37	29	330	−29.1	16	14	319	−36.0		28	326	−29.8	45
10,000	27	281	−39.8	23	27	285	−36.8	39	28	262	−39.2		12	284	−37.3		29	287	−37.2	16	12	276	−43.5		28	284	−37.0	44
11,000	25	242	−47.1		27	246	−44.5		28	243	−46.9		9	245	−44.9		29	248	−44.9		11	237	−49.7		28	245	−44.5	
12,000	24	208	−53.6		27	212	−51.9		28	209	−53.5		6	212	−52.7		29	213	−51.8		9	203	−54.3		28	211	−51.5	
13,000	22	177	−57.9		27	181	−58.1		27	179	−57.9		5	180	−58.7		28	182	−57.3		7	173	−55.7		28	180	−57.9	
14,000	22	151	−59.9		27	154	−62.6		26	152	−60.0						28	155	−61.2		7	147	−57.0		28	154	−62.3	
15,000	22	128	−61.0		27	131	−65.9		26	130	−60.9						27	132	−64.5		5	125	−57.0		27	130	−63.5	
16,000	20	109	−62.1		26	111	−67.7		24	110	−62.1						24	112	−67.9						27	111	−64.6	
17,000	19	93	−62.3		23	94	−68.3		21	94	−62.0						20	95	−70.1						24	94	−64.6	
18,000	13	79	−61.1		22	79	−66.0		15	80	−61.6						14	80	−67.7						22	80	−63.6	
19,000	5	67	−59.4		19	67	−62.4		9	68	−59.5														15	68	−62.5	
20,000					13	57	−59.4																		10	58	−59.7	
21,000					5	49	−56.6																					

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																											
	St. Paul, Minn. (225 m.)				San Antonio, Tex. (175 m.)				San Diego, Calif.[1] (19 m.)				S. S. Marie, Mich. (221 m.)				Seattle, Wash.[1] (27 m.)				Spokane, Wash. (598 m.)				Washington, D. C. (25 m.)			
	Number of observations	Pressure	Temperature	Realtive humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Realtive humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	29	987	18.5	77	30	991	27.1	73	30	1,009	16.2	82	30	989	13.2	84	30	1,014	16.5	70	30	944	16.3	62	30	1,012	22.0	77
500	29	955	17.7	74	30	955	26.1	74	30	953	14.9	78	30	957	15.1	73	30	959	13.6	67					30	958	20.2	72
1,000	29	901	15.3	75	30	902	23.7	70	30	899	19.5	44	30	902	14.0	65	30	903	10.3	67	30	900	14.8	57	30	904	17.7	71
1,500	29	850	12.7	76	30	852	21.2	66	30	849	19.9	24	30	850	11.0	65	30	850	7.0	65	30	848	11.2	58	30	853	15.0	73
2,000	29	800	10.3	71	30	804	18.1	65	30	801	18.5	16	30	800	7.8	67	30	799	3.7	68	30	798	7.2	65	30	804	12.3	76
2,500	29	753	7.8	66	30	758	14.9	62	30	754	15.9	14	30	753	5.3	64	30	751	0.5	69	30	751	3.4	73	30	757	9.7	72
3,000	29	709	5.2	62	30	715	12.1	58	30	711	13.3	14	30	708	2.8	60	30	706	−2.5	65	29	706	0.0	79	30	713	7.3	64
4,000	29	627	−0.4	52	30	634	6.5	49	30	631	6.9	13	30	625	−2.3	53	30	622	−8.5	55	29	622	−6.1	75	29	631	2.5	56
5,000	28	552	−6.4	46	30	561	0.5	44	30	557	−0.3	20	29	551	−8.1	47	30	546	−14.6	56	28	547	−12.3	65	29	557	−2.9	51
6,000	28	485	−12.9	45	30	494	−5.8	37	30	491	−7.4		28	484	−14.6	45	28	478	−21.4	61	28	479	−19.2	60	28	490	−8.6	48
7,000	28	425	−19.4	42	30	434	−12.5	34	30	431	−14.7		26	423	−21.5	44	28	416	−28.4	63	27	418	−26.2	58	26	430	−14.9	47
8,000	27	370	−27.1	39	30	380	−19.8	32	17	377	−22.7		24	368	−28.8	44	26	361	−35.3	62	27	363	−33.2	57	24	376	−21.9	44
9,000	26	321	−34.8	38	30	331	−26.9	31	17	328	−30.7		23	319	−36.1	43	25	312	−42.3		27	314	−40.2	56	22	327	−29.0	42
10,000	26	278	−42.2		29	288	−34.3	31	16	284	−38.3		22	276	−42.3		24	269	−47.7		26	271	−46.3		22	284	−36.4	42
11,000	26	240	−48.7		29	249	−41.9		16	246	−45.2		18	238	−47.7		24	231	−50.4		26	233	−51.1		21	246	−44.0	
12,000	26	205	−53.7		28	214	−48.7		15	211	−51.6		18	204	−51.1		23	198	−51.7		26	199	−53.0		17	211	−51.7	
13,000	25	175	−57.0		28	184	−54.8		14	180	−57.3		16	175	−53.7		22	170	−51.8		26	171	−52.7		16	181	−58.5	
14,000	22	149	−58.2		27	157	−60.0		14	154	−62.3		14	149	−55.5		18	145	−51.6		25	146	−52.9		15	154	−62.9	
15,000	21	127	−58.4		26	133	−64.9		11	130	−64.8		14	128	−56.5		15	124	−52.2		24	125	−53.3		11	131	−64.3	
16,000	21	108	−58.5		23	113	−69.0		9	110	−66.5		9	109	−57.5		14	106	−52.6		22	107	−54.3		10	112	−63.4	
17,000	18	92	−58.8		19	95	−71.4		6	94	−68.3		7	93	−57.6		11	91	−52.3		17	91	−54.6		10	95	−63.0	
18,000	13	78	−58.5		18	80	−70.7		5	80	−66.4		5	79	−56.5		5	77	−52.0		14	78	−54.3		10	80	−62.2	
19,000	8	67	−56.8		13	68	−67.3														11	67	−54.6		8	69	−60.3	
20,000	6	57	−55.5		8	57	−62.7																					

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees Centigrade, and relative humidities in percent obtained by airplanes and radiosondes during June 1942*—Continued

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level															
	Anchorage Alaska (42 m.)				Barrow, Alaska (6 m.)				Bethel, Alaska, (7 m.)				Fairbanks, Alaska (156 m.)			
	Number of observations	Pressure	Temperature	Realtive humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,006	15.7	55	30	1,015	1.6	92	30	1,008	14.8	60	30	990	20.0	42
500	30	953	12.6	53	30	955	3.2	73	30	951	10.5	63	30	951	17.6	43
1,000	30	898	8.7	57	30	898	4.4	64	30	895	6.5	69	30	897	13.2	47
1,500	30	844	4.9	63	30	844	2.8	60	30	842	3.1	75	30	844	9.0	52
2,000	30	794	1.1	71	30	793	0.6	58	30	791	−0.2	76	30	795	5.2	57
2,500	30	746	−2.2	75	30	745	−2.1	58	30	743	−3.1	76	30	747	1.3	62
3,000	30	700	−5.3	75	30	700	−5.2	58	30	697	−5.9	74	30	702	−2.2	63
4,000	30	615	−10.9	71	29	615	−11.1	58	29	613	−11.7	70	30	618	−8.5	66
5,000	30	540	−17.3	68	29	539	−17.3	53	29	537	−18.1	65	29	543	−14.8	66
6,000	26	472	−23.9	66	29	471	−23.8	50	29	469	−24.4	61	29	475	−21.4	63
7,000	26	410	−31.0	64	29	410	−31.0	49	29	408	−31.4	55	29	413	−28.7	61
8,000	24	356	−38.5	60	29	355	−38.4		28	354	−38.5	55	29	359	−36.3	59
9,000	24	307	−45.3		27	306	−44.7		28	305	−44.9		28	310	−43.4	
10,000	23	264	−50.6		27	263	−48.4		27	262	−48.0		28	267	−48.8	
11,000	23	227	−51.0		27	226	−49.0		27	226	−47.0		28	229	−50.9	
12,000	22	194	−49.2		27	194	−47.1		27	194	−44.9		27	196	−50.1	
13,000	21	167	−47.7		26	167	−45.4		27	167	−44.4		27	168	−47.8	
14,000	20	143	−47.4		25	144	−45.2		26	144	−45.0		27	144	−46.9	
15,000	19	123	−47.6		24	124	−45.2		25	124	−45.5		25	124	−46.5	
16,000	18	106	−47.5		22	107	−45.1		25	107	−45.6		24	107	−46.1	
17,000	18	91	−47.3		19	92	−45.0		25	92	−45.4		21	92	−45.8	
18,000	16	78	−47.0		16	79	−44.4		23	79	−45.0		19	78	−45.5	
19,000	15	67	−46.7		15	68	−43.5		19	68	−44.6		9	68	−44.8	
20,000	10	57	−45.9		7	58	−42.5		15	58	−44.1					
21,000	8	49	−45.2						7	50	−43.8					

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level															
	Juneau, Alaska (49 m.)				Ketchikan, Alaska (26 m.)				McGrath, Alaska (103 m.)				Nome, Alaska (14 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	1,009	15.2	65	30	1,013	14.4	71	30	996	17.9	48	30	1,006	11.1	75
500	30	956	12.0	68	30	957	11.0	74	30	950	14.4	49	30	951	10.4	71
1,000	30	901	8.3	74	30	902	7.9	78	30	895	10.1	54	30	896	7.2	73
1,500	30	848	4.9	80	30	849	5.0	80	30	842	6.1	61	30	842	4.5	74
2,000	30	797	1.7	83	30	798	2.0	79	30	792	2.3	66	30	792	1.3	74
2,500	30	749	−0.9	81	30	750	−0.7	76	30	744	−1.1	71	30	744	−1.5	71
3,000	28	703	−3.6	78	30	704	−3.5	74	30	699	−4.0	72	30	698	−4.4	67
4,000	27	619	−9.1	74	30	620	−9.0	72	30	615	−10.3	73	30	614	−10.6	64
5,000	26	543	−14.8	68	27	544	−15.1	69	29	539	−16.7	68	30	539	−17.1	59
6,000	24	475	−21.3	65	26	476	−21.6	66	29	471	−23.2	66	30	471	−23.6	55
7,000	23	414	−28.5	62	24	414	−28.5	63	29	410	−30.1	65	30	410	−30.6	53
8,000	21	359	−36.0	63	24	360	−35.7	61	29	356	−37.3	64	29	355	−38.0	51
9,000	21	310	−44.0		19	311	−43.1		29	307	−43.9		28	306	−44.5	
10,000	19	267	−49.6		17	268	−49.4		28	264	−47.6		28	263	−47.4	
11,000	19	229	−50.7		13	230	−51.6		28	227	−48.2		28	227	−47.2	
12,000	17	197	−49.6		11	197	−51.7		27	195	−46.4		28	195	−45.7	
13,000	17	169	−47.8		11	168	−50.6		27	168	−45.4		27	168	−45.0	
14,000	17	145	−47.1		10	144	−49.4		27	145	−45.5		27	144	−45.1	
15,000	17	125	−47.0		8	124	−49.1		25	124	−45.7		26	124	−45.2	
16,000	17	107	−46.9		7	106	−48.6		24	107	−45.4		24	107	−45.2	
17,000	16	92	−46.9						21	92	−45.2		22	92	−45.1	
18,000	14	79	−46.7						18	79	−44.8		22	79	−44.7	
19,000	12	68	−46.4						15	68	−44.6		20	69	−44.3	
20,000	7	59	−45.9						11	59	−44.4		11	59	−43.6	
21,000													5	51	−43.0	

All observations taken at 11 p. m., 75th meridian time.

None of the means included in this table are based on less than 15 surface or 5 standard level observations.

Number of observations refers to pressure only, as temperature and humidity are missing for some observations at certain levels, also, the humidity data are not used in daily observations when the temperature is below −40° C.

Stations marked with the figure one (1) are Navy stations.

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during June 1942. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second.*

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (866 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (17 m.)			Cincinnati, Ohio (152 m.)			Denver, Colo. (1,627 m.)			El Paso, Tex. (1,196 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	154	4.4	30	223	2.6	29	208	0.9	30	348	0.4	30	281	1.8	30	314	3.8	30	129	6.0	29	245	2.5	29	191	1.7	30	154	3.0	30	114	0.5	27	101	2.9	30	253	2.2
500							29	220	0.7										30	143	6.9	29	259	2.7	29	192	2.2	30	151	3.1	30	257	0.4						
1,000	30	157	4.5				29	241	1.2				30	270	1.6	30	311	4.4	29	154	5.4	29	262	3.2	27	248	2.6	27	193	1.6	30	252	1.2						
1,500	30	176	5.1				29	270	1.4	30	322	1.6	29	271	3.7	30	316	4.8	29	165	4.1	26	273	2.8	26	275	4.2	25	297	1.4	29	262	2.0				30	260	3.4
2,000	30	197	4.5	30	239	3.5	26	302	2.2	30	264	1.4	24	271	5.8	30	295	4.2	26	166	2.8	25	274	4.5	22	279	6.7	23	308	2.2	28	269	3.7	27	112	4.1	30	257	3.4
2,500	29	210	2.9	30	235	5.5	23	302	3.2	30	254	3.5	18	263	6.2	30	281	4.7	21	232	1.5	24	274	5.6	21	279	7.4	19	299	1.5	20	273	4.6	27	120	4.0	30	258	3.6
3,000	27	230	3.2	30	231	6.3	21	302	4.2	28	252	6.9	14	263	9.2	26	263	5.9	18	293	1.7	18	270	6.9	16	282	7.7	18	319	1.6	20	271	4.7	26	168	2.9	30	262	4.3
4,000	25	269	2.9	29	250	7.1	18	275	3.1	22	255	9.8	11	254	10.3	22	248	7.2	15	318	4.8	15	280	7.7				15	238	1.4	15	283	5.5	21	244	5.4	30	269	5.3
5,000	21	299	3.9	28	265	10.4	12	276	2.6	17	260	9.8	10	260	11.8	20	251	8.7	14	278	3.6	12	280	11.2				11	260	3.6	11	268	4.7	18	252	9.6	30	267	7.5
6,000	20	311	4.3	26	270	11.2	12	269	3.5	11	265	12.8	10	247	15.2	20	258	11.6	14	290	4.3													14	259	12.2	26	277	7.5
8,000	19	315	5.8	21	266	16.4	10	259	3.9							15	276	18.0	13	286	5.8													10	246	15.6	23	288	9.4
10,000	16	304	4.4	20	270	27.2										12	277	22.9	13	274	9.3																17	286	11.5
12,000	16	271	7.2	16	271	19.8																															14	290	14.1
14,000	16	280	8.1																																				
16,000	15	275	7.8																																				
18,000	11	257	5.2																																				

Altitude (meters) m. s. l.	Ely, Nev. (1,910)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Joliet, Ill. (178 m.)			Las Vegas, Nev. (570 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (10 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (194 m.)			New York, N. Y. (15 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	218	3.2	23	238	1.8	28	176	1.0	25	274	2.5	29	122	2.0	28	250	0.9	30	174	2.9	28	148	1.5	30	309	2.6	29	116	2.9	29	176	2.6	30	237	1.1	29	192	0.8
500							28	195	1.1				29	157	2.3	28	231	1.1				28	154	2.3	30	312	3.4	28	138	3.7	29	184	2.6	30	197	1.2	28	239	2.7
1,000							28	252	1.9	25	282	3.3	25	222	2.7	28	232	2.1	30	188	3.2	28	179	2.4	30	307	2.7	26	161	2.7	27	213	2.3	30	208	1.7	28	256	3.5
1,500							28	268	2.5	25	278	3.7	23	252	3.0	24	257	2.8	30	197	3.8	28	195	2.0	29	292	2.4	26	166	1.8	22	251	1.6	29	248	2.4	26	274	4.6
2,000	30	224	3.5	23	238	2.6	27	284	3.5	24	271	3.9	20	264	2.6	20	265	4.5	30	214	4.4	24	220	2.3	29	260	2.6	24	188	2.1	18	250	1.6	29	262	3.5	22	277	4.6
2,500	30	229	3.3	23	237	4.5	26	297	3.7	20	262	5.8	18	266	2.2	15	270	5.3	30	222	5.2	21	238	3.3	26	247	2.7	24	170	2.0	12	240	3.2	28	264	3.6	20	293	5.4
3,000	30	237	3.7	23	245	5.8	25	290	5.1	14	252	8.0	16	263	3.1	10	275	6.4	30	237	6.2	21	249	3.3	26	266	3.6	20	148	2.5				27	268	4.0	15	291	6.5
4,000	30	236	5.4	21	231	8.0	24	286	7.5										30	252	8.6	19	253	3.4	26	275	6.7	16	258	0.6				24	285	4.5			
5,000	25	246	9.7	20	226	7.8	19	283	6.5										30	264	11.7	14	279	2.7	25	270	8.4	11	233	1.7				17	277	3.7			
6,000	20	268	12.8	18	244	9.6	18	273	6.3										30	262	13.5				23	271	11.7	11	233	3.3				11	282	3.3			
8,000	14	278	17.8				17	271	8.2										29	260	17.5				19	266	16.9												
10,000	12	279	24.0				12	275	9.8										24	270	24.4				17	272	14.9												
12,000																			23	270	25.6				10	276	16.3												
14,000																			19	267	24.4																		

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)			Oklahoma City Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			St. Paul, Minn. (225 m.)			San Antonio, Tex. (180 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie Mich. (230 m.)			Seattle, Wash. (12 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	265	6.3	29	160	4.9	30	177	1.9	30	247	1.6	30	102	1.7	29	266	0.8	29	198	1.4	30	126	2.8	27	230	4.1	29	306	1.2	29	249	2.0	30	226	2.5	30	254	1.1
500	30	285	4.6	29	158	5.0	30	178	2.1	30	243	2.7				29	241	1.1	29	214	2.1	30	131	4.4	27	232	2.4	29	282	1.8	29	229	1.7				30	261	1.4
1,000	28	303	3.9	29	161	5.4	30	182	2.8	30	249	3.4	30	98	1.6	25	255	2.8	25	231	3.3	29	135	5.0	23	256	1.7	28	290	3.7	27	231	2.1	30	228	3.7	26	257	2.8
1,500	28	307	4.8	25	185	6.0	27	221	3.0	30	234	3.2	30	163	.3	24	256	3.5	22	234	4.5	29	152	4.5	23	269	2.2	26	267	3.4	25	230	2.5	30	224	3.2	24	267	4.5
2,000	28	299	3.9	22	203	6.7	24	248	4.9	30	218	4.7	30	240	2.4	21	269	4.5	18	241	5.5	29	169	3.9	22	278	3.4	23	287	3.6	20	239	2.6	28	235	3.4	22	275	5.5
2,500	28	298	4.6	19	218	6.2	21	257	5.4	30	220	6.2	22	249	6.1	20	271	5.1	14	255	9.1	29	201	1.7	22	271	5.2	20	297	4.7	19	231	2.8	20	216	2.0	20	281	6.3
3,000	28	295	5.7	16	228	6.8	17	260	4.5	30	235	8.0	19	256	8.1	19	276	6.1	11	268	10.3	27	218	1.3	19	259	7.4	18	287	6.0	14	210	2.5	17	206	3.2	16	288	7.0
4,000	27	291	7.6	15	242	6.1	16	248	6.7	30	247	8.6	16	263	11.2	17	279	6.0				23	188	1.4	18	251	8.4	11	283	7.3	13	266	2.7				12	298	10.6
5,000	27	282	9.8	14	257	5.5	11	265	10.5	29	250	9.9	11	258	16.2	12	294	8.8				17	205	1.0	15	256	9.7				10	272	4.6				11	284	13.0
6,000	27	279	12.6	12	264	6.9	11	273	11.8	29	251	10.1				11	289	8.7				16	296	2.0	12	244	9.9				10	279	5.7				11	280	14.3
8,000	24	279	14.6							27	270	12.8										14	311	4.6															
10,000	20	269	19.4							25	278	17.5										13	276	9.5															
12,000	14	267	20.6							23	275	19.8										11	268	17.0															
14,000										15	269	19.6																											

Late Reports for Table 2.

Altitude (meters) m. s. l.	MAY 1942 Boise, Idaho (866 m.)			APRIL 1942 Chicago, Ill. (192 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	30	324	2.6	29	186	1.5
500				29	191	2.7
1,000	30	314	2.8	29	205	3.7
1,500	30	299	3.4	27	223	3.5
2,000	29	285	3.5	24	258	4.8
2,500	27	271	2.8	22	271	5.9
3,000	22	255	2.9	20	286	6.6
4,000	18	239	4.8	17	310	8.9
5,000	15	275	5.7	14	321	10.8
6,000	12	290	7.3	13	329	13.7

TABLE 3.—*Maximum free-air wind velocities (m. p. s.) for different sections of the United States based on pilot-balloon observations during June 1942*

Section	Surface to 2,500 meters (m. s. l.)					Between 2,500 and 5,000 meters (m. s. l.)					Above 5,000 meters (m. s. l.)				
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Station
Northeast [1]	31.0	NNW	1,900	5	Hartford, Conn.	32.0	WSW	4.600	23	Boston, Mass.	56.8	NW WNW	7,120 11,950	20 15	Boston, Mass. Kylertown, Pa.
East-Central [2]	34.7	W	2,500	13	Nashville, Tenn.	39.6	WSW	4,280	24	Richmond, Va.	49.0	W	12,820	14	Nashville, Tenn.
Southeast [3]	23.4	WNW	2,500	13	Atlanta, Ga.	29.0	WNW	3,460	13	Atlanta, Ga.	43.5	NW	16,500	18	Miami, Fla.
North-Central [4]	45.7	W	1,790	21	Duluth, Minn.	35.8	WSW	4,090	12	Marquette, Mich.	58.0	W	8,850	17	Huron, S. Dak.
Central [5]	33.2	SW	1,580	26	Dodge City, Kans.	33.8	WNW	4,350	22	DesMoines, Iowa.	44.3	WSW	12,130	14	St. Louis, Mo.
South-Central [6]	31.4	SE	2,490	21	Big Spring, Tex.	34.9	SE	2,670	21	Big Spring, Tex.	43.0	WSW	13,260	16	San Antonio, Tex.
Northwest [7]	38.5	WNW	1,510	19	Billings, Mont.	33.8	W	4,060	16	Billings, Mont.	58.0	W W	8,770 9 040	---- 17	Great Falls, Mont.
West-Central [8]	28.8	W	2,500	12	Grand Junction, Colo.	48.4	WSW	4,410	11	Casper, Wyo.	68.8	W	10,630	19	Reno, Nev.
Southwest [9]	38.5	WSW	2,470	27	Winslow, Ariz.	38.5	WSW	3,370	27	Winslow, Ariz.	79.2	WSW	9 130	27	Winslow, Ariz.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

Precipitation during June was above normal throughout the country except for a few scattered areas. The greatest exception was the far Southwest where a large area, for the second consecutive month, received little or no precipitation. The driest states for the two months of May and June were Arizona and New Mexico. On the other hand, the Plains States had an abundance of rain during June, and for the first 6 months of the year precipitation was generally well above normal in this area.

Extensive floods occurred in the Plains States from South Dakota to Texas from frequent, and at times heavy, rains; and local floods resulted in northern New England from unusually heavy thundershowers near the middle of the month. The Missouri River from Blair, Nebr., to its mouth and most of the Mississippi River above Cairo, Ill., were in flood. The Mississippi and Missouri River floods combined at St. Louis to produce unusually high stages between that point and Cairo, Ill.

Atlantic Slope drainage.—High stages occurred in the Presumpscot, Androscoggin and Kennebec River Basins in Maine as the result of rainfall of high intensities during the period June 14–18. The storm occurred in two phases, causing two crests on most streams. The peak stages were not unusually high but damage was caused in some sections by the heavy rainfall and resultant floods, especially to crops and highways.

Intense rainfall on the afternoon and evening of June 14, in the upper Connecticut and Merrimack River Basins produced unusually rapid rises in some of the tributary streams in New Hampshire. In the Connecticut Basin, Oliverian Brook, between Glencliff and East Haverhill, N. H., overflowed causing severe damage to highways and bridges and Mascoma River flooded the streets of Canaan, N. H. The upper reach of the Connecticut River, immediately below Pittsburgh Reservoir overflowed causing damage to the extent of $40,000. At Hartford, Conn., the river rose 7 feet above the stage on the 15th, reaching a crest of 10.2 feet on the 18th.

In the Merrimack River Basin above Nashua, N. H., rains beginning about 3 p. m., June 14, and continuing for 12 hours averaged 3.75 inches. The greatest amounts were concentrated in the Bakers River Valley and in the upper portion of Smith River, where over 8 inches of rain occurred, resulting in serious flooding in these rivers. At Rumney, N. H., Bakers River reached a peak stage of 15.5 feet on June 15, exceeding the floods of March 1936 and September 1938 and second only to the flood of 1927 at that station. The Pemigewasset River was in moderate flood at and above Plymouth, N. H. Elsewhere in the Merrimack Basin, flows did not reach flood proportions. Damages, the greater part of which occurred in the Bakers River area, have been estimated at $53,000.

In the remainder of the Atlantic Slope drainage, showers on June 14 in the upper Susquehanna River Basin were sufficiently heavy to raise that river slightly above flood stage at Oneonta, N. Y., and heavy showers on June 10–11 over the Roanoke River Basin caused slight flooding at Randolph, Va., and Weldon, N. C., but stages were not sufficiently high to cause damage.

East Gulf of Mexico drainage.—The only flooding reported during the month was at Centerville, Ala., on the Cababa River, where a stage of 30.8 feet occurred on June 13. The damage was negligible.

Ohio Basin.—Light flooding occurred in the White River and its tributary, the West Fork, between June 15 and June 30. The total damage from the flooding has been estimated at about $45,000, the greater part of which was to growing crops. The overflow resulted from frequent rains, which occurred on more than half of the days in the month and totalled from 7 to more than 10 inches for the month at stations in the area.

Upper Mississippi Basin.—Heavy rains over the upper portions of the Chippewa and Wisconsin River Basins caused moderate flooding in these streams on the first of the month. A series of rains beginning on June 7 and continuing to June 27, occurred over most of the Mississippi River area above Cairo, Ill., and produced moderate flooding in the Mississippi River from Winona, Minn., to just above the mouth of the Ohio River and in tributary streams in Minnesota, Wisconsin, Iowa, Missouri, and Illinois. A discussion of these floods will be given in a later issue of the REVIEW. The flood in the Missouri River, which is discussed below, combined with the flood in the upper Mississippi River to produce unusually high stages in the reach between St. Louis, Mo., and the mouth of the Ohio River. The crest at St. Louis was 34.3 feet on June 30, and 36.9 feet at Cape Girardeau, Mo., on July 2. A comparison of the crest stages in this flood with previous high stages is shown in the accompanying table.

The Tennessee and Ohio Rivers remained low throughout the month, a condition which decreased the flood height of the Mississippi in the vicinity of the Ohio River. Flood stage was not reached from this point downstream.

Missouri Basin.—Heavy rainfall during the first part of June in the Big Sioux and Floyd River Basins produced record high stages in those streams and resulted in extensive overflow and considerable damage in both basins.

In the Floyd River a crest of 18.8 feet occurred on June 5 at James, Iowa, surpassing the previous high stage of record, 18.1 feet in 1936. Upstream from this point, the river is said to have been as high or higher than in 1881, the greatest known flood in the Floyd River. In spite of the high water, the damage in Sioux City, Iowa, was negligible, due to recent channel improvements and construction of high levees. Above Sioux City the flood damage was mainly to crops, fields, dikes, fences, and roads.

In the Big Sioux River a stage of 19.3 feet at Akron, Iowa, was reached on June 4, 0.1 foot below the highest stage, in September 1926, when a high-water mark of 19.4 was established. The river spread out in some districts to a width of 3 miles and thousands of acres of farm land were under water.

The Republican River overflowed slightly on two occasions during the month, the first from June 12 to 15 and the second from the 24th to the 27th. In both cases, the flooding extended from slightly above Guide Rock, Nebr., to below Clay Center, Kans., and was confined only to very low places.

The other tributaries of the Kansas River, the Solomon, Saline, Smoky Hill and Blue Rivers, and the Kansas River itself, experienced moderate to rather serious floods with considerable damage, largely from flooded crops. The greater part of this damage occurred in the basin of the Kansas River, which overflowed from Manhattan to below Lawrence, Kans., except that bankful stages were not quite reached at Wamego, Kans. Crest stages in the Kansas River generally ranged from 1 to 2 feet above bankful. At Topeka, Kans., the crest was 22.5 feet on June 21, but protecting levees prevented any part of the city from being flooded.

The next most damaging overflow was along the Smoky Hill River from Ellsworth, Kans., to its mouth. At Lindsborg, Kans., a crest of 27.95 feet, 6.95 feet above bankful, was recorded on the 21st, and at Salina, Kans., a crest of 22.65 feet, 2.65 feet above bankful, occurred on the 23rd. The only city that suffered material damage was Salina, where a considerable part of the eastern section was flooded.

The floods in the Solomon and Big Blue Rivers were of minor importance.

In eastern Nebraska, heavy to excessive rainfall occurred on June 19–20 and flood stages prevailed in the Elkhorn River for a few hours at Norfolk on the 20–21st with a crest of 10.25 feet. There was some overflow at a few places above and below Norfolk but damage was mostly light. However, moderate damage occurred at a number of places in eastern Nebraska from flooding of small creeks and draws many of which are dry most of the time.

In the Grand, Osage, Gasconade and lower Missouri River Basins rains occurred on June 1–2, were almost continuous from the 5–19th, and were heavy on the 25th and 26th, causing moderate flooding in the Gasconade and Osage Rivers and severe flooding in the Grand and lower Missouri Rivers. Jerome, Mo., in the Gasconade Basin, recorded a total of 14.50 inches of precipitation for the month; Waverly, Mo., on the Missouri River, had 12.70 inches while other stations in this area had amounts generally in the neighborhood of 10 inches.

The Missouri River which was still at moderately high stages following generous rains during May rose to high stages again in June when heavy rains occurred over western Iowa, eastern Kansas and Nebraska and northern Missouri during much of the month.

The Missouri River first exceeded flood stage in the vicinity of Nebraska City, Nebr., on June 6 and from that date to the end of the month was in flood at most points downstream to its mouth. The river crested at Nebraska City on June 22 at a stage of 18.4 feet, the same as the record stage reached during the preceding month. The most serious overflow in this area was in Mills and Fremont Counties, Iowa, where considerable damage had occurred in May. Damage was moderate in Monona County, Iowa, near Onawa, and in Washington County, Nebr., near Blair where the river remained above flood stage several days, reaching 19.4 feet on June 10–11. Severe damage to crops was sustained in several counties immediately above and below Kansas City, due to creek overflows, and in the vicinity of Lexington, Mo. The crest stage at Kansas City was 24.2 feet on June 22 and 24.3 feet at Lexington, Mo., on June 27.

In the reach of the lower Missouri River below Kansas City, stages began a slow rise on June 7, reaching unusually high stages near the end of the month. On June 6, a series of rains began over this portion of the basin and from that date until the 27th, precipitation was reported daily from stations in the basin. The combination of high discharges from the Missouri above Kansas City and from the Kansas River, plus the heavy discharges from the Grand, Osage, and Gasconade Rivers, and other small tributaries, in the lower basin, produced unusually high stages in the extreme lower Missouri River, closely

approaching the highest stages of record. A comparison of the stages in this flood with the previous high stages of record is given in the accompanying table.

Arkansas-Red Basin.—Moderate floods occurred in the Verdigris, Neosho, Canadian and the main Arkansas River in the Arkansas Basin and in the Sulphur River in the Red Basin during the month.

The Arkansas River overflowed near Oxford, Kans., on June 21, extending to a short distance above Little Rock, Ark., near the end of the month. The flooding in the vicinity of Arkansas City, Kans., was severe although the city itself was protected by levees. The high stages in this area were caused by heavy rains in the Ninnescah and Walnut River Basins and over the Arkansas River above Arkansas City during the afternoon of June 20, producing rapid rises in the streams.

In the Cottonwood and Neosho Rivers, crest stages were generally 3 to 5 feet above bankful during the latter part of the month with the overflow lasting about a week.

The Canadian and Sulphur Rivers overflowed slightly during the second week of June.

West Gulf of Mexico drainage.—Several separate rises occurred in the Trinity River during the month as the result of a flood, which was in progress at the close of May, plus further heavy rains during June. The overflows were light to moderate and in general the crest stages in the May floods were higher than subsequent ones.

In the Rio Grande, the releases of water from Elephant Butte Reservoir decreased from 8,000 second feet on June 1 to 5,000 second feet on June 30. The water level in the Cabello Reservoir, immediately below Elephant Butte Dam, was lowered likewise, and by the end of the month the old river channel could accommodate all of the released water. June was a very dry month in this area and a considerable amount of water was used for irrigation purposes. As a result, practically all of the land that was flooded in the Candelaria-Presidio irrigated district was above water on June 30.

Crest stages for floods of June 1942 in Mississippi and Missouri River Basins and comparison with previous maximum floods

River and station	Previous maximum flood known: During period of record: Date	Crest stage	Prior to gage records: Date	Crest stage	Crest stage during present flood: Date	Crest stage
Mississippi Basin		Feet		Feet		Feet
Salt River: New London, Mo.	June 1928	28.8			June 29	25.5
Mississippi River:						
Dubuque, Iowa	June 1880	21.7			June 12	19.3
Keokuk, Iowa	May 1888	19.6	June 1851	21.0	June 16	15.8
St. Louis, Mo	June 1903	38.0	June 1844	41.4	June 30	34.3
Chester, Ill	April 1927	34.4	do	39.9	July 1	33.9
Cape Girardeau, Mo	do	40.0	July 1844	42.5	July 2	36.9
Missouri Basin						
Big Sioux River: Akron, Iowa.	March 1929	18.6	September 1926.	19.4	June 4	19.3
Floyd River: James, Iowa	March 1936	[1] 18.1			June 5	18.8
Grand River:						
Chillicothe, Mo	June 1929	32.1	July 1909	33.6	June 27	30.8
Brunswick, Mo	June 1935	20.5	do	23.0	June 29	21.8
Missouri River:						
Nebraska City, Nebr	May 1942	18.4	April 1881	18.0	June 22	18.4
Kansas City, Mo	June 1903	34.95	June 1844	38.0	do	24.2
Waverly, Mo	June 1935	22.0			June 27	21.8
Boonville, Mo	June 1903	30.9	June 1844	32.7	June 29	27.5
Hermann, Mo	do	29.5			June 28	29.4
St. Charles, Mo	do	36.8	June 1844	40.1	June 29	34.8

[1] Ice jam.

The extreme lower Rio Grande was slightly above flood stage at Mercedes and Brownsville, Tex., on June 27–28 but the water generally was confined within the levees.

Gulf of California and Pacific Slope drainages.—Stages continued high in the upper Colorado River, and some flooding occurred in the Gunnison River during the month, but there was no damage of consequence.

Streams were high during the first three weeks of June in the upper San Joaquin River Basin and in the Tulare Lake Basin. Kings River at Piedra, Calif., exceeded flood stage slightly, reaching a peak stage of 10.8 feet on June 10–12.

The Columbia River exceeded flood stage at Vancouver, Wash., from June 12–22, with a crest of 15.8 feet (flood stage 15 feet).

NOTE.—A complete report of the floods of April and May in the Missouri, Arkansas, Red and Trinity River Basins will be given in a later issue of the REVIEW. Data on flood losses and savings for floods during the period April–June have not been fully assembled. A tabulation of these data also will appear in a later issue.

FLOOD-STAGE REPORT FOR JUNE 1942

[All dates in June unless otherwise specified]

River and Station	Flood stage	Above flood stages—dates: From—	To—	Crest: Stage	Date
ATLANTIC SLOPE DRAINAGE	Feet			Feet	
Bakers: Rumney, N. H	7	14	15	15.5	15
Pemigewasset:					
Woodstock, N. H	8	15	15	9.0	15
Plymouth, N. H	11	15	15	13.7	15
Connecticut: North Stratford, N. H	10	16	16	10.0	16
Susquehanna: Oneonta, N. Y	12	15	16	14.0	15
Roanoke:					
Randolph, Va	21	12	12	21.3	12
Weldon, N. C	31	13	14	31.3	14
Williamston, N. C	10	(1)	2	10.9	May 30
EAST GULF OF MEXICO DRAINAGE					
Cahaba: Centerville, Ala	23	12	14	30.8	13
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Chippewa:					
Holcombe, Wis	22	May 30	3	25.9	May 30-31
Durand, Wis	11	May 31	4	14.1	1
Zumbro: Theilman, Minn	35	May 29	2	37.3	1
Black: Galesville, Wis	12	1	3	12.6	2
		7	8	12.5	8
Wisconsin:					
Knowlton, Wis	12	May 30	2	18.65	May 31
		6	8	13.5	7
Wisconsin Rapids, Wis	12	1	1	12.2	1
Portage, Wis	17	3	6	18.4	4–5
Rock: Moline, Ill	10	14	15	10.05	15
Cedar: Waterloo, Iowa	12	4	4	12.2	4
Salt: New London, Mo	19	27	30	25.5	29
Bourbeuse: Union, Mo	12	23	24	13.2	24
		26	29	17.5	28
Meramec:					
Sullivan, Mo	11	21	22	12.6	22
		26	27	14.9	27
Pacific, Mo	11	May 31	2	16.8	1
		14	17	16.4	16
		23	23	14.0	23
		26	30	20.0	29
Valley Park, Mo	14	1	2	15.6	1
		15	17	16.0	17
		24	24	14.0	24
		26	(2)	21.9	29
Mississippi:					
Winona, Minn	13	3	6	13.2	4–5
La Crosse, Wis	12	3	10	13.0	5
Lansing, Iowa	18			14.3	9–10
Dubuque, Iowa	18	9	16	19.3	12
Gordons Ferry, Iowa				17.4	12–13
Clinton, Iowa	16	10	19	17.8	13–14
Davenport, Iowa	15	13	16	15.2	14–15
Muscatine, Iowa	15	11	22	17.6	15
Keithsburg, Ill	12	11	22	14.05	15
Burlington, Iowa	15	14	19	15.5	16
Keokuk, Iowa	12	11	25	15.8	16
Gregory Landing, Mo	12	10	25	15.6	15–17
Quincy, Ill	14	11	26	17.7	17

See footnotes at end of table.

FLOOD-STAGE REPORT FOR JUNE 1942—Continued

River and Station	Flood stage	Above flood stages—dates From—	Above flood stages—dates To—	Crest Stage	Crest Date
MISSISSIPPI SYSTEM—continued					
Upper Mississippi Basin—Continued					
Mississippi—Continued.	*Feet*			*Feet*	
Hannibal, Mo	13	9	28	17.7	19
Louisiana, Mo	12	11	29	16.3	20
Grafton, Ill	18	19	(2)	21.7	29
St. Louis, Mo	30	23	(2)	34.3	30
Chester, Ill	27	21	(2)	33.9	July 1
Cape Girardeau, Mo	32	24	(2)	36.9	July 2
Missouri Basin					
James: Scotland, S. Dak.[3]	13			15.5	May 15
Big Sioux: Akron, Iowa	12	May 14	May 17	13.6	May 16
		May 28	10	19.3	4
		28	(2)	14.0	29
Floyd: James, Iowa	14	May 29	May 31	14.2	May 29
		3	9	18.8	5
		20	23	15.7	22
		29	(2)	16.8	30
Elkhorn: Norfolk, Nebr	10	20	21	10.2	21
Saline: Tescott, Kans	25	20	21	26.3	20
Solomon: Beloit, Kans	18	25	27	22.3	26
Smoky Hill:					
Ellsworth, Kans	20	19	19	20.7	19
Lindsborg, Kans	21	20	22	27.95	21
Salina, Kans	20	22	24	22.65	23
Enterprise, Kans	26	19	22	27.5	20
		24	27	28.45	25
Republican:					
Guide Rock, Nebr	10	12	14	10.8	13
		24	26	11.0	24
Scandia, Kans	10	13	13	10.0	13
		25	26	11.1	25
Concordia, Kans	8	13	14	8.5	13
		25	26	8.8	25
Clay Center, Kans	15	14	15	16.0	14
		25	27	16.4	26
Big Blue:					
Barnston, Nebr	18	20	20	21.1	20
Randolph, Kans	22	21	22	22.0	21-22
Kansas:					
Manhattan, Kans	17	20	23	18.0	20, 22
		25	28	18.5	27
Topeka, Kans	21	20	21	22.5	21
Le Compton, Kans	17	20	21	19.5	21
Lawrence, Kans	18	21	21	19.3	21
Thompsons Fork: Trenton, Mo	20	26	27	22.4	26
Grand:					
Gallatin, Mo	20	21	24	30.7	23
		25	27	26.0	26
Chillicothe, Mo	18	20	30	30.8	27
Brunswick, Mo	12	12	(2)	21.8	29
Osage:					
Osceola, Mo	20	20	24	23.4	22
		25	28	21.6	26
Warsaw, Mo				33.1	18
Lakeside, Mo	60	17	30	62.4	19
St. Thomas, Mo	23	19	28	27.2	21
				26.7	27
Gasconade: Jerome, Mo	15	20	21	17.1	20
Missouri:					
Blair, Nebr	18	9	12	19.4	10-11
Omaha, Nebr	19			18.3	11
Nebraska City, Nebr	15	6	25	18.4	22
		29	30	16.0	29
St. Joseph, Mo	17	23	26	17.1	24
Kansas City, Mo	22	20	29	24.2	22
Lexington, Mo	18	5	5	18.0	5
		8	(2)	24.3	27
Waverly, Mo	18	13	(2)	21.8	27
Boonville, Mo	21	22	(2)	27.5	29
Jefferson City, Mo	23	22	(2)	29.6	28
Hermann, Mo	21	19	(2)	29.4	28
St. Charles, Mo	25	15	17	25.3	16
		19	(2)	34.8	29

FLOOD-STAGE REPORT FOR JUNE 1942—Continued

River and Station	Flood stage	Above flood stages—dates From—	Above flood stages—dates To—	Crest Stage	Crest Date
MISSISSIPPI SYSTEM—continued					
Ohio Basin	*Feet*			*Feet*	
West Fork of White: Edwardsport, Ind	12	14	20	15.5	18
		21	30	16.0	24
White:					
Petersburg, Ind	16	23	25	16.4	24
Hazelton, Ind	16	23	26	16.6	24
Arkansas Basin					
Verdigris: Sageeyah, Okla	35	22	27	37.7	25
Cottonwood: Emporia, Kans	20	25	27	23.6	26
Neosho:					
Neosho Rapids, Kans	22	26	27	22.7	26-27
Burlington, Kans	23	20	22	25.8	22
		26	28	25.9	27
Iola, Kans	15	20	22	17.3	21
Chanute, Kans	20	20	23	25.5	21
		25	27	20.7	26
Parsons, Kans	22	21	28	25.4	23, 25
Oswego, Kans	17	21	30	22.1	25
Ft. Gibson, Okla	22	22	27	25.3	26
		27	29	26.6	28
North Canadian:					
Woodward, Okla	5	11	11	5.5	11
Canton, Okla	9	11	11	9.4	11
Canadian: Union City, Okla	6	10	10	7.0	10
Arkansas:					
Arkansas City, Kans	16	19	25	21.8	22
Ralston, Okla	16	22	25	19.1	24
Webbers Falls, Okla	23	22	28	27.4	26
Ft. Smith, Ark	22	23	30	27.2	26
Van Buren, Ark	22	23	30	26.1	27
Ozark, Ark	22	26	26	22.2	26
Dardanelle, Ark	22	25	29	23.5	28
Morrilton, Ark	20	28	28	20.0	28
Red Basin					
Sulphur:					
Hagansport, Tex	36	11	12	37.5	11
		15	19	40.0	16
Naples, Tex	22	17	25	25.9	20
WEST GULF OF MEXICO DRAINAGE					
Elm Fork of Trinity: Carrollton, Tex	6	7	7	7.4	7
		16	17	7.6	16
East Fork of Trinity: Rockwall, Tex	10	7	8	11.2	7
		9	14	13.0	12
		15	19	12.8	17
Trinity:					
Dallas, Tex	28	7	10	31.6	8
		15	19	33.8	16
Rosser, Tex	26	9	22	30.1	19-20
Trinidad, Tex	28	(1)	3	39.0	May 25
		11	27	35.0	23
Long Lake, Tex	40	(1)	3	42.6	May 28
Liberty, Tex	24	(1)	23	28.9	May 14
				26.5	13-16
Rio Grande:					
Mercedes, Tex	21	27	28	21.9	27
Brownsville, Tex	18	27	28	18.3	28
GULF OF CALIFORNIA DRAINAGE					
Colorado Basin					
Roaring Fork: Carbondale, Colo	5	7	9	5.3	7
		11	13	5.8	12
		17	21	5.7	18
Gunnison: Delta, Colo	9	(1)	15	10.4	8
		18	21	9.4	19
PACIFIC SLOPE DRAINAGE					
Kings: Piedra, Calif	10	5	7	10.7	6
		9	18	10.8	10-12
Columbia: Vancouver, Wash	15	12	22	15.8	17-19

[1] Continued from previous month.
[2] Continued into following month.
[3] Records furnished by U. S. Geological Survey.

CLIMATOLOGICAL DATA

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables and charts, see REVIEW, January 1940, page 32]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Section	Temperature								Precipitation					
	Section average	Departure from the normal	Monthly extremes						Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date			Station	Amount	Station	Amount
	° F.	° F.		° F.			° F.		In.	In.		In.		In.
Alabama	78.7	+0.4	Spring Hill	101	15	Valley Head	50	24	5.72	+1.52	Spring Hill	15.03	Chase	1.07
Arizona	73.8	−1.6	2 stations	116	[1] 21	Alpine	21	1	T	−.36	Stephens Ranch	.51	131 stations	.00
Arkansas	77.2	−.1	Nashville	104	29	Rogers	45	14	4.54	+.47	Mountain Valley	9.91	Ozark	1.93
California	66.7	−1.4	Cow Creek	119	30	Ellery Lake	18	3	.06	−.26	Lake City	1.42	225 stations	.00
Colorado	61.1	−.6	Las Animas	103	19	Pearl	20	1	2.07	+.65	Graft	6.74	4 stations	.00
Florida	80.1	+.3	Fort Myers	100	16	Bartow	56	8	10.32	+3.52	Belle Glade	24.11	Carrabelle	3.78
Georgia	78.5	+.4	2 stations	100	21	Jasper	50	15	5.05	+.57	Thomasville	10.60	Washington	1.88
Idaho	56.8	−3.5	3 stations	100	30	Sun Valley	18	20	1.60	+.28	Roland	5.77	Milner Dam	T
Illinois	72.4	+.3	Springfield (Spaulding Dam).	100	3	7 stations	40	[1] 14	5.46	+1.51	Greenville	12.23	Chicago Heights	1.36
Indiana	72.3	+.8	2 stations	99	[1] 2	2 stations	40	14	5.55	+1.65	Paoli	11.82	Notre Dame	1.74
Iowa	69.7	+.1	Ottumwa	99	4	Decorah	34	14	5.93	+1.28	Lamoni	14.03	Donnellson	2.94
Kansas	72.7	−1.1	2 stations	102	[1] 18	2 stations	40	14	6.49	+2.48	Wellington	14.47	Hoxie	2.39
Kentucky	74.7	+.8	Henderson	98	2	Lynch (near)	41	[1] 15	5.54	+1.38	Pikeville	11.57	Smiths Grove	1.65
Louisiana	80.2	−1.6	Lake Providence	99	28	Doyline	60	14	8.40	+3.62	Crowley	17.23	Jonesville	2.21
Maryland-Delaware	72.2	+1.4	Pocomoke City, Md.	99	21	2 stations	39	[1] 24	3.91	−.08	Mount Savage Summit, Md.	7.71	Odessa, Del.	1.44
Michigan	64.7	+.3	Eloise	97	30	4 stations	29	[1] 14	3.45	+.36	Charlotte	7.09	Detour	.50
Minnesota	63.1	−1.7	2 stations	92	[1] 5	Itacca State Park	29	13	3.60	−.44	Grand Meadow	9.14	Hallock	.93
Mississippi	79.3	+.4	Clarksdale	101	28	3 stations	53	24	4.42	+.18	Biloxi	12.67	Fulton	1.82
Missouri	73.3	−.3	5 stations	98	[1] 4	Albany	35	13	7.70	+3.01	Morehouse	14.51	Kahoka	2.78
Montana	56.1	−3.8	Thompson Falls	94	30	Lima	17	21	3.16	+.67	Turner	8.85	Dillon	.69
Nebraska	68.2	−1.2	Ashland	100	4	Gordon	34	13	5.12	+1.47	Bertrand	12.74	Hyannis	1.59
Nevada	64.5	−.1	Overton	113	[1] 22	3 stations	25	[1] 7	.24	−.27	Golliher Pasture	1.38	24 stations	.00
New England	64.9	+.9	Woodland, Maine	96	12	4 stations	30	1	4.54	+1.07	North Bridgeton, Maine.	10.88	Hyannis, Mass	1.60
New Jersey	69.8	+.8	Canoe Brook	96	13	Charlotteburg	41	10	3.11	−.72	Layton	6.98	Woodstown	1.22
New Mexico	68.8	.0	2 stations	110	[1] 19	Elizabethtown	24	1	.84	−.42	Pasamonte (near)	5.02	33 stations	.00
New York	66.2	+1.2	do	97	[1] 11	Salisbury	33	9	3.00	−.64	Sharon Springs No. 1	6.86	Clarence Center	.69
North Carolina	75.6	+1.6	Greenville	106	22	Mount Mitchell	38	14	4.84	+.16	Highlands	10.16	Wilson	1.49
North Dakota	60.1	−2.9	Milnor	90	10	Portal	27	13	3.12	−.30	Fullerton	7.59	Foxholm	1.00
Ohio	71.2	+1.6	3 stations	95	[1] 2	Millport	41	18	4.19	+.28	Eaton	8.88	Steubinville	1.85
Oklahoma	77.0	−.2	Hollis	107	17	Kenton	45	15	6.69	+2.76	Cushing	16.77	Waynoka	1.35
Oregon	56.8	−2.8	4 stations	105	30	2 stations	20	[1] 11	1.65	+.38	Timberline Lodge	9.48	Klamath	.07
Pennsylvania	69.0	+.9	2 stations	96	[1] 10	Coudersport	34	16	3.83	−.31	Gouldsboro	8.16	Williamsport	1.10
South Carolina	78.8	+1.2	Orangeburg	102	20	Caesars Head	49	15	5.00	+.22	Rimini	9.80	Ware Shoals	1.45
South Dakota	64.1	−2.3	Wagner	94	27	3 stations	32	[1] 13	4.27	+.84	Glenham	8.11	Pierre	1.37
Tennessee	76.4	+1.6	Samberg	101	4	Dover	46	15	3.73	−.47	Copperhill	8.47	New River	1.55
Texas	80.4	+.2	2 stations	115	11	Stratford	43	22	3.39	+.43	Port Arthur	15.04	Laredo	.09
Utah	63.1	−1.5	St. George	104	30	Soldier Summit	23	28	.27	−.32	Lewiston	1.68	38 stations	.00
Virginia	73.3	+1.5	Diamond Springs	103	21	Mountain Lake	37	26	5.29	+1.08	Mountain Lake	11.98	Cape Henry	.45
Washington	59.0	−1.9	North Dalles	106	30	Stockdill Ranch	28	19	2.86	+1.29	Cedar Lake	12.09	Wenatchee	.22
West Virginia	71.4	+1.7	Valley Chapel	99	11	3 stations	35	[1] 15	5.17	+.69	Hackers Creek	9.66	Ravenswood	2.19
Wisconsin	64.7	−.4	Brodhead	95	28	Laona	28	14	4.66	+.58	Sparta	8.76	Ashland	1.49
Wyoming	56.6	−2.1	Thermopolis	95	25	Hunter's Station	18	13	1.43	−.20	Colony	5.61	3 stations	T
Alaska [May]	47.4	+5.8	View Cove	84	18	Nulato	−2	8	1.30	−.30	Latouche	10.48	Livengood	.05
Hawaii	74.3	+.6	Makaweli	94	[1] 5	Nui Ridge	50	[1] 1	5.38	+.43	Kahana	35.52	4 stations	.00
Puerto Rico	79.0	+.9	2 stations	97	[1] 4	3 stations	60	[1] 2	7.48	+1.49	La Mina (El Yunque)	23.38	Coamo (near)	1.26

[1] Other dates also.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS

District and station	Elevation of instruments: Barometer above sea level	Thermometer above ground	Anemometer above ground	Pressure: Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Temperature of the air: Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet thermometer	Mean temperature of the dewpoint	Mean relative humidity	Precipitation: Total	Departure from normal	Days with 0.01 inch, or more	Wind: Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F		°F	°F		°F	°F	°F	°F.	%	In.	In.		Miles								0-10	In.	In.	
New England							63.7	+1.2										80	4.13	+1.1										6.2			
Eastport	75	67	85	29.87	29.95	+0.02	55.1	0.0	81	21	63	42	3	47	33	52	50	87	3.06	+0.1	14	8.3	s.	28	e.	16	7	7	16	6.7	0.0	0.0	3
Greenville, Me.	1,070	6	41	29.80	29.95		61.2	+2.2	91	12	74	30	1	48	42	57	54		5.73	+1.8	14		s.				5	13	12		.0	.0	5
Portland, Me.[1]	103	5	36	29.82	29.94	-.01	62.4		90	12	73	37	2	52	33	58	55	80	5.94	+2.7	14	7.1	s.	21	s.	12	11	9	10	5.5	.0	.0	5
Concord[2]	289	4	45	29.62	29.94	-.02	64.9	+2.0	92	12	77	44	9	53	45	60	57	77	5.36	+2.2	14	6.0	nw.	24	n.	7	12	9	9	5.3	.0	.0	8
Burlington[2]	403	11	48	29.50	29.93	-.03	65.1	-.6	88	12	74	43	9	56	37	61	58	76	6.36	+3.0	12	7.2	s.	26	s.	30	6	6	18	7.0	.0	.0	9
Northfield	876	12	60	29.02	29.95	-.01	62.4	+1.1	89	12	74	36	1	51	46				5.02	+1.8	14	6.4	s.	20	sw.	12	6	10	14	6.9	.0	.0	7
Boston[1]	124	33	62	29.81	29.94	-.02	67.4		91	13	75	48	18	59	28	60	56	72	4.24	+1.4	16	9.4	sw.	29	nw.	19	3	14	13	6.7	.0	.0	5
Nantucket	12	10	63	29.95	29.96	-.02	63.2	+2.2	79	20	70	47	1	56	23	60	58	89	1.63	-1.0	13	9.2	sw.	23	sw.	7	7	9	14	6.7	.0	.0	0
Block Island	26	11	46	29.94	29.97	.00	63.9	+2.1	79	20	70	51	2	58	20	60	59	87	1.64	-1.0	12	11.7	sw.	25	w.	25	12	11	7	4.4	.0	.0	3
Providence[2]	159	46	60	29.80	29.97	.00	68.7	+.4	93	13	77	50	18	60	28	61	58	77	3.44	+.8	14	7.8	sw.	31	sw.	7	4	13	13	6.6	.0	.0	2
Hartford[1]	159	5	44	29.78	29.96	-.01	68.2		89	13	78	50	2	59	31	62	59	78	4.03	+1.0	11	7.7	sw.	24	n.	5	6	9	15	6.8	.0	.0	5
New Haven[2]	107	74	153	29.86	29.97	.00	68.4	+1.8	86	19	76	50	2	60	28	63	60	80	3.06	.0	11	7.4	s.	21	nw.	5	8	10	12	6.0	.0	.0	3
Middle Atlantic States							72.4	+1.9										75	3.27	-0.3										6.2			
Albany[1]	97	26	40	29.84	29.94	-.03	67.8	+1.1	90	29	78	48	9	58	39	61	57	71	2.52	-.6	12	7.9	s.	25	se.	30	6	10	14	6.5	.0	.0	6
Binghamton	871	57	79	29.06	29.98	+.01	68.0	+2.4	88	30	78	47	6	58	37	61	57	73	3.69	+.3	12	5.2	se.	20	w.	30	5	11	14	6.7	.0	.0	6
New York	314	415	454	29.62	29.96	-.02	69.8	+1.0	86	13	77	52	3	62	23	63	59	73	5.69	+2.4	16	11.2	nw.	34	nw.	19	8	10	12	6.1	.0	.0	8
Harrisburg[1]	374	30	49	29.57	29.97	-.02	71.4		91	20	81	54	16	62	34	65	61	75	3.63	.0	15	6.9	se.	43	sw.	12	4	11	15	6.9	.0	.0	8
Philadelphia[2]	114	174	367	29.84	29.96	-.02	72.6	+1.2	93	20	81	55	2	64	24	65	61	71	2.13	-1.1	14	10.6	nw.	30	w.	14	9	9	12	5.5	.0	.0	4
Reading	323	47	306	29.63	29.97		71.8	+1.4	91	20	81	55	3	63	29				4.74	+1.2	14	9.5	nw.	31	nw.	14	10	6	14	6.0	.0	.0	5
Scranton	805	72	104	29.12	29.97	-.01	68.6	+.8	87	29	79	50	15	59	33				3.71	.0	17	5.6	n.	31	nw.	19	6	14	10	6.1	.0	.0	9
Atlantic City	52	37	172	29.91	29.96	-.02	70.4	+3.8	92	21	77	55	2	64	26	65	62	80	1.46	-1.6	12	12.6	s.	28	n.	12	4	13	13	6.6	.0	.0	5
Trenton	190	89	107	29.76	29.96		71.1	+1.6	90	20	80	53	2	62	28	64	60	73	1.24	-1.8	13	7.4	s.	22	nw.	14	5	11	14	6.5	.0	.0	4
Baltimore[2]	123	100	215	29.84	29.97	-.02	74.4	+1.7	93	21	82	57	2	66	23	66	63	71	2.26	-1.6	10	9.3	s.	33	sw.	7	6	10	14	6.6	.0	.0	7
Washington[1]	112	62	85	29.90	29.97	-.03	74.4	+2.2	95	12	83	58	24	66	26	67	63	73	5.35	+1.2	12	6.6	nw.	26	nw.	4	8	10	12	5.9	.0	.0	7
Cape Henry	18	8	54	29.94	29.96		76.0	+3.1	98	21	82	64	16	70	26	70	68	79	.45	-3.5	8	9.7	se.	32	nw.	14	9	12	9	5.5	.0	.0	6
Lynchburg	686	144	184	29.26	29.99	-.02	76.0	+1.4	96	21	86	58	25	66	28	68	65	75	6.14	+2.4	12	6.1	nw.	25	nw.	4	6	12	12	6.1	.0	.0	12
Norfolk[2]	91	80	125	29.87	29.97	-.03	77.3	+2.9	98	21	85	64	25	69	23	70	67	76	1.23	-3.0	10	8.6	e.	24	w.	21	5	15	10	6.3	.0	.0	10
Richmond[2]	144	11	52	29.81	29.96	-.05	75.8	+1.7	99	21	85	60	16	67	27	69	66	80	4.75	+.8	9	6.6	sw.	22	n.	14	7	14	9	5.8	.0	.0	8
South Atlantic States							78.7	+2.2										78	4.38	-0.2										5.9			
Asheville	2,253	89	104	27.71	29.98	-.03	73.0	+4.3	93	21	84	50	15	62	32	65	63	79	2.07	-1.9	12	6.3	nw.	29	nw.	13	2	16	12	6.6	.0	.0	10
Charlotte[2]	779	63	86	29.16	29.97	-.04	78.6	+3.1	97	21	88	60	15	69	24	70	67	76	6.82	+2.6	11	6.1	s.	17	sw.	6	4	19	7	6.0	.0	.0	9
Greensboro[1]	886	6	56	29.06	29.99		75.6		94	21	86	57	15	65	29	68	66	77	4.23		15	6.8	s.	32	nw.	19	4	17	9	6.0	.0	.0	10
Hatteras	11	5	50	29.96	29.97	-.04	77.4	+1.8	88	21	83	65	16	72	17	73	71	81	3.12	-1.4	3	10.3	sw.	26	w.	14	8	17	5	4.8	.0	.0	3
Raleigh[1]	376	27	69	29.58	29.97	-.04	77.8	+2.1	98	21	89	61	3	67	28	70	66	74	4.34	.0	11	7.2	sw.	32	w.	13	6	12	12	6.0	.0	.0	8
Wilmington	72	73	107	29.91	29.98	-.03	78.2	+1.4	96	21	86	65	15	71	22	71	69	78	4.76	-.3	10	8.1	sw.	30	n.	19	12	12	6	4.9	.0	.0	5
Charleston[2]	48	11	92	29.92	29.97	-.04	80.0	+1.1	97	21	87	69	13	73	24	74	72	83	5.30	+.7	11	10.1	se.	36	nw.	13	13	8	9	5.2	.0	.0	7
Columbia, S. C.[2]	347	70	91	29.60	29.96	-.05	80.1	+2.0	99	21	90	63	15	70	25	72	69	77	4.67	+.5	10	7.4	s.	28	sw.	22	6	15	9	5.9	.0	.0	8
Greenville, S. C.[1]	1,040	70	78	28.90	29.97		78.0	+3.9	97	21	88	59	15	68	27	69	65	71	1.90	-2.6	10	7.7	sw.	29	nw.	13	0	22	8	6.6	.0	.0	10
Augusta[2]	182	62	77	29.78	29.96	-.05	80.6	+1.9	98	21	90	66	15	71	23	71	68	74	1.99	-2.7	13	5.2	s.	27	nw.	13	7	12	11	6.1	.0	.0	9
Savannah[2]	65	73	152	29.91	29.98	-.03	81.1	+2.1	96	19	90	69	17	73	24	74	72	80	5.21	-.1	13	9.2	se.	36	sw.	12	5	13	12	6.3	.0	.0	8
Jacksonville[2]	43	86	110	29.94	29.98	-.03	80.5	+.6	94	16	88	69	1	73	25	74	72	83	7.99	+2.7	18	7.1	sw.	32	sw.	22	2	18	10	6.7	.0	.0	16
Florida Peninsula							81.7	+1,0										82	9.93	+3.8										6.4			
Key West[2]	21	10	64	29.94	29.96	-0.03	82.4	+.5	90	23	88	69	27	77	16	78	76	82	9.10	+4.9	12	8.0	e.	29	se.	7	10	8	12	5.8	.0	.0	8
Miami[2]	25	124	168	29.94	29.97	-.03	81.2	+1.2	89	5	87	68	3	76	19	76	74	83	13.90	+7.0	18	8.3	se.	29	sw.	9	5	8	17	7.2	.0	.0	15
Tampa[1]	35	5	61	29.94	29.98	-.03	81.4	+1.2	95	16	89	69	1	74	21	75	73	82	6.80	-.4	16	9.0	e.	29	s.	7	7	13	10	6.1	.0	.0	18
East Gulf States							79.5	+0.6										79	7.29	+2.8										6.0			
Atlanta[1]	1,173	5	72	28.77	29.96	-.05	77.8		94	21	87	60	15	68	29	70	66	75	3.61	-.3	8	7.6	e.	41	nw.	13	4	16	10	6.4	.0	.0	14
Macon[2]	370	79	87	29.58	29.96	-.05	79.2	+.3	95	20	89	62	25	70	28	71	66	75	3.20	-.8	11	6.3	e.	26	s.	16	2	14	14	6.8	.0	.0	9
Thomasville	273	49	58	29.70	29.99	-.01	79.4	-.1	94	14	89	65	1	70	27				10.60	+5.2	13						1	13	16		.0	.0	15
Apalachicola	35	11	51	29.92	29.96		80.0	+.2	91	14	86	70	16	74	19	75	74	82	5.57	.0	12	7.9	sw.	30	e.	4	9	13	8	5.3	.0	.0	11
Pensacola	56	54	79	29.90	29.96	-.03	79.8	+.5	96	14	86	68	27	74	25	74	72	81	12.68	+8.0	13	7.6	sw.	26	e.	27	9	13	8	5.1	.0	.0	9
Anniston	741	9					77.4	+2.4	95	27	89	55	25	66	35				2.75	-1.4	9		se.				11	17	2		.0	.0	8
Birmingham[2]	700	11	48	29.24	29.97	-.02	78.4	+.5	95	27	88	61	24	69	26	69	66	72	4.68	+.2	13	6.1	s.	22	s.	11	7	15	8	5.5	.0	.0	15
Mobile[2]	57	6	30	29.89	29.95	-.04	81.0	+.7	97	13	89	69	25	73	23	73	72	83	13.07	+7.6	14	6.2	s.	22	s.	16	3	18	9	6.3	.0	.0	13
Montgomery[2]	218	92	105	29.73	29.96	-.04	79.6	.0	95	27	89	65	15	70	24	71	68	77	6.29	+2.5	15	6.4	e.	28	w.	15	6	13	11	6.4	.0	.0	13
Meridian[2]	375	67	92	29.56	29.95	-.03	79.3	+1.2	95	28	89	62	25	69	29	72	69	79	4.91	+.4	16	5.8	e.	20	w.	13	9	14	7	4.5	.0	.0	15
Vicksburg[2]	247	82	102	29.67	29.93	-.04	79.4	+.4	96	28	88	66	15	71	25	72	70	83	4.11	+.1	15	7.9	s.	23	nw.	22	4	15	11	6.4	.0	.0	16
New Orleans[2]	53	76	84	29.88	29.93	-.05	81.4	+.8	94	14	88	70	21	75	17	74	72	81	16.01	+10.1	16	5.8	se.	27	e.	4	3	12	15	7.0	.0	.0	16
West Gulf States							80.7	+1.0										76	4.88	+1.2										5.5			
Shreveport[1]	249	92	227	29.63	29.90	-.06	81.3	+.9	98	29	91	66	14	72	25	73	71	77	6.04	+2.5	14	8.7	s.	35	s.	26	5	12	13	6.4	.0	.0	13
Bentonville	1,303	12	51	28.58	29.91	-.03	73.0	-1.1	92	3	82	46	14	64	29				7.28	+3.1	16		s.				3	26	1		.0	.0	14
Fort Smith	463	57	82	29.40	29.87	-.07	78.5	+1.0	97	3	88	54	14	69	26	70	67	70	4.85	+1.1	13	6.9	e.	47	nw.	13	10	10	10	5.4	.0	.0	15
Little Rock[2]	357	94	102	29.54	29.91	-.05	78.2	+.8	97	28	88	60	14	69	26	71	69	78	3.94	+.2	12	7.0	s.	32	nw.	13	5	18	7	5.9	.0	.0	10
Austin[2]	605	68	90	29.23	29.85		82.8	+1.6	100	12	93	64	10	72	27	72	69	70	2.23	-.2	5	9.4	s.	37	sw.	15	9	18	3	4.6	.0	.0	6
Brownsville[2]	57	88	96	29.77	29.83		83.2	+.8	101	9	91	66	1	75	26	76	74	80	13.06		11	11.3	se.	27	se.	15	7	14	9	5.9	.0	.0	8
Corpus Christi[2]	20	11	78	29.83	29.85	-.06	83.5	+2.5	95	11	90	64	6	77	23	76	75	84	3.30	+.7	9	11.1	s.	33	s.	15	13	8	9	4.9	.0	.0	9
Dallas[1]	512	6	46	29.33	29.86		80.7		98	12	90	62	15	72	25	72	69	71	3.87	.0	7	11.1	s.	32	w.	15	10	10	10	5.5	.0	.0	7
Fort Worth	679	35	56	29.16	29.86	-.06	81.4	+1.5	100	12	92	60	14	71	27	72	68	70	3.23	-.1	7	11.1	s.	32	n.	15	6	13	11	5.7	.0	.0	5
Galveston[2]	54	106	114	29.83	29.88	-.07	81.9	+1.2	89	30	86	68	10	78	17	76	74	81	3.06	-1.3	7	10.4	s.	33	n.	10	9	18	3	4.8	.0	.0	6
Houston[2]	138	157	190	29.74	29.88		81.5	+.1	95	13	90	65	10	73	22	75	73	81	4.89	+.3	13	9.1	se.	29	n.	30	3	18	9	6.2	.0	0	13
Palestine	510	64	72	29.37	29.89	-.05	79.5	+.5	93	13	89	64	14	70	23	72	70	76	3.78	+.2	10	6.9	s.	28	nw.	15	9	16	5	5.0	.0	.0	8
Port Arthur	34	59	134	29.86	29.89		81.2		94	28	88	66	11	74	23	75	73	78	15.04	+10.2	15	11.6	s.	41	ne.	3	5	18	7	5.7	.0	.0	14
San Antonio[1]	693	28	59	29.13	29.84	-.06	83.4	+2.4	105	12	94	64	1	73	29	73	69	70	1.95	-.5	8	8.6	se.	34	w.	5	3	25	2	5.2	.0	.0	5

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments			Pressure			Temperature of the air												Precipitation			Wind											
	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Total	Departure from normal	Days with 0.01 inch, or more	Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Maximum velocity: Direction	Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F		°F	°F		°F	°F	°F	°F.	%	In.	In.		Miles								0-10	In.	In.	
Ohio Valley and Tennessee							73.7	+1.8										77	4.72	+0.8										6.2			
Chattanooga [1]	762	21	54	29.17	29.96	-.04	77.2	-----	95	28	88	54	15	66	31	70	67	75	4.59	-----	11	5.3	s.	40	nw.	13	5	13	12	6.2	.0	.0	13
Knoxville [2]	995	66	84	28.94	29.97	-.03	76.7	+2.7	95	21	88	52	15	66	31	69	65	73	2.04	-2.1	13	7.2	sw.	32	w.	13	11	16	3	4.5	.0	.0	10
Memphis [2]	399	78	86	29.51	29.91	-.06	78.8	+1.2	97	2	89	57	24	68	28	71	68	74	2.39	-1.2	11	6.7	sw.	32	nw.	13	12	9	9	4.9	.0	.0	12
Nashville [1]	546	5	72	29.37	29.94	-.05	77.8	-----	97	28	89	55	15	67	32	69	65	69	1.87	-2.1	12	7.1	sw.	46	w.	13	7	15	8	5.4	.0	.0	9
Lexington	989	6	-----	28.93	29.98	-.02	74.4	+2.2	95	2	86	51	15	63	30	-----	-----	-----	5.72	+1.7	15	-----	s.	-----	-----	-----	10	14	6		.0	.0	12
Louisville [2]	525	106	120	29.40	29.96	-.02	74.4	-.3	92	5	84	52	14	65	23	68	65	78	8.48	+4.7	17	6.7	sw.	35	nw.	4	3	19	8	6.2	.0	.0	14
Evansville [1]	431	5	38	29.48	29.93	-.04	74.6	-----	94	3	85	50	15	64	29	68	65	76	3.23	-.8	11	6.4	n.	36	s.	11	4	12	14	6.5	.0	.0	13
Indianapolis [2]	823	98	129	29.09	29.95	-.02	73.6	+2.0	93	4	83	47	14	64	32	66	64	82	7.65	+4.0	18	6.4	s.	22	nw.	13	4	8	18	7.1	.0	.0	12
Terre Haute [2]	575	68	149	29.35	29.96	-----	74.0	-----	94	4	83	48	14	65	29	68	65	80	8.37	+4.4	17	7.4	se.	36	sw.	13	6	6	18	6.7	.0	.0	14
Cincinnati [2]	627	11	51	29.30	29.96	-.03	73.0	+1.8	93	2	83	52	15	63	26	67	65	80	5.38	+1.7	15	5.4	ne.	21	sw.	20	5	13	12	6.4	.0	.0	8
Columbus [2]	822	90	110	29.11	29.96	-.03	73.3	+2.4	93	29	82	52	24	64	28	65	62	75	2.95	-.4	11	7.7	s.	39	w.	30	3	15	12	6.5	.0	.0	6
Dayton [2]	900	186	213	29.02	29.96	-----	72.4	+1.5	92	1	81	50	15	63	26	65	62	76	4.27	+.5	15	7.9	sw.	30	w.	6	4	12	14	6.8	.0	.0	14
Elkins [2]	1,947	61	78	27.98	29.98	-.02	69.2	+2.3	88	1	80	46	25	58	32	63	62	85	6.33	+1.3	19	4.9	se.	25	ne.	4	1	14	15	7.0	.0	.0	10
Parkersburg	637	77	84	29.29	29.96	-.04	73.7	+2.3	92	1	83	52	25	64	31	66	64	76	3.48	-.5	11	4.8	se.	26	nw.	2	7	11	12	5.8	.0	.0	11
Pittsburgh [1]	842	39	54	29.08	29.97	-.02	70.8	+1.3	89	6	80	52	15	62	28	64	60	75	3.99	+.2	16	8.8	s.	34	sw.	12	0	15	15	7.2	.0	.0	8
Lower Lake Region							71.5	+1.5										74	2.59	-0.8										6.0			
Buffalo [2]	768	243	280	29.15	29.97	.00	65.7	+1.3	88	10	73	49	25	59	30	61	57	73	.76	-2.1	12	10.6	sw.	38	w.	23	8	10	12	5.9	.0	.0	4
Canton	448	10	61	29.46	29.93	-----	66.2	+1.1	92	30	77	43	9	56	39	60	56	72	.72	-2.6	14	6.4	w.	24	sw.	30	5	11	14	6.6	.0	.0	7
Ithaca	836	77	100	-----	-----	-----	67.0	+.8	88	12	78	45	16	56	37	-----	-----	-----	2.39	-1.2	12	7.3	nw.	24	se.	1	7	9	14	6.3	.0	.0	4
Oswego	335	71	85	29.59	29.95	-.02	64.8	.0	91	30	73	48	9	57	28	60	57	75	2.28	-1.0	12	7.4	w.	24	n.	14	13	7	10	5.1	.0	.0	3
Rochester [1]	523	5	69	29.40	29.96	-.01	67.8	-----	94	30	79	46	16	57	39	61	57	73	1.03	-2.0	12	7.3	sw.	30	w.	23	5	13	12	6.3	.0	.0	4
Syracuse [1]	596	5	51	29.32	29.96	-.01	67.4	+2.9	93	30	78	45	16	57	39	62	59	76	2.09	-1.8	11	7.9	s.	50	nw.	19	6	12	12	6.2	.0	.0	3
Erie [2]	714	57	81	29.21	29.97	-.01	67.8	+1.6	90	10	75	53	15	61	22	62	60	79	1.53	-1.8	11	6.6	ne.	20	w.	23	7	14	9	5.8	.0	.0	3
Cleveland [1]	762	27	54	29.15	29.96	-.02	70.6	-----	92	29	80	51	24	61	30	64	60	72	4.09	+1.0	12	8.4	s.	36	sw.	30	1	18	11	6.6	.0	.0	9
Sandusky	629	5	67	-----	-----	-----	70.6	+1.8	93	30	79	51	24	62	28	-----	-----	-----	4.21	+.7	11	7.4	ne.	20	nw.	22	3	19	8	6.1	.0	.0	8
Toledo [2]	628	79	87	29.29	29.97	.00	69.8	+1.1	92	29	78	48	15	62	23	63	60	75	3.47	+.1	9	8.4	e.	23	w.	23	20	6	4	3.5	.0	.0	8
Fort Wayne [1]	857	69	84	29.05	29.96	-----	70.0	+2.6	92	29	80	47	15	60	29	64	61	75	6.12	+2.6	10	6.6	e.	33	n.	20	1	16	13	6.8	.0	.0	12
Detroit [1]	730	5	78	29.20	29.97	.00	69.0	-----	90	29	79	46	15	59	30	62	58	70	2.31	-1.2	11	7.7	ne.	29	w.	23	3	17	10	6.3	.0	.0	4
Upper Lake Region							63.2	+0.8										75	3.26	-0.1										6.4			
Alpena	609	5	89	29.32	29.97	+.01	62.0	+1.6	84	29	71	45	9	53	28	57	53	75	1.56	-1.7	13	8.5	se.	28	nw.	13	7	13	10	5.7	.0	.0	3
Escanaba	612	51	72	-----	29.98	+.04	60.8	+.1	81	12	68	38	14	53	-----	-----	-----	76	2.69	-.5	14	8.6	s.	28	nw.	5	7	9	14	-----	.0	.0	5
Grand Rapids [2]	707	70	244	29.20	29.96	-.01	69.4	+1.6	94	29	79	43	14	60	32	62	59	77	4.06	+.6	12	8.6	e.	27	sw.	29	6	15	9	5.6	.0	.0	7
Lansing	878	5	90	29.04	29.97	-----	67.0	+.6	88	29	76	43	15	57	30	62	59	75	4.48	+1.0	14	6.5	e.	21	nw.	13	5	14	11	6.0	.0	.0	7
Marquette	734	44	73	29.16	29.96	+.02	59.9	+1.0	89	10	68	41	14	52	27	54	50	73	2.91	-.3	11	6.4	nw.	23	s.	10	6	13	11	6.0	.0	.0	7
Sault Sainte Marie [1]	614	11	52	29.31	29.98	+.02	59.5	+.9	83	10	71	40	15	48	38	55	52	75	2.69	.0	10	8.4	se.	26	nw.	13	10	5	15	6.1	.0	.0	2
Chicago	673	7	131	29.25	29.96	.00	68.2	+.9	94	29	75	50	13	61	26	62	58	77	1.87	-1.4	10	8.0	ne.	25	nw.	22	3	13	14	7.1	.0	.0	8
Green Bay	617	109	141	29.31	29.98	+.03	64.9	.0	86	29	74	44	14	56	24	59	55		4.83	+1.1	12	8.7	se.	31	w.	5	3	11	16	7.1	.0	.0	6
Milwaukee [1]	681	33	66	29.24	29.97	+.02	64.0	+1.9	90	29	74	42	14	54	31	59	55	74	4.26	+.9	9	9.3	ne.	28	sw.	29	4	11	15	6.9	.0	.0	7
Duluth	1,133	5	47	28.73	29.95	+.03	56.8	-.4	82	11	66	36	13	48	32	53	50	79	3.23	-.7	18	9.8	ne.	35	nw.	11	4	9	17	7.0	.0	.0	7
North Dakota							61.1	-1.9										72	3.18	-0.4										6.2			
Fargo [1]	940	5	43	28.89	29.90	.00	62.6	-1.8	84	10	72	37	13	53	30	58	54	75	2.32	-1.7	8	12.5	se.	34	w.	21	4	12	14	6.9	.0	.0	5
Bismarck [1]	1,677	4	41	28.13	29.89	+.02	61.5	-1.4	84	3	72	33	23	51	36	56	51	71	2.21	-1.1	14	12.9	nw.	40	w.	16	9	12	9	5.6	.0	.0	4
Devils Lake	1,478	11	44	28.33	29.88	.00	60.1	-1.8	81	9	70	39	13	51	30	54	50	73	2.63	-.9	13	9.4	se.	23	nw.	22	4	7	19	7.4	.0	.0	3
Lemmon, S. Dak	2,602	4	38	27.21	29.90	-----	59.8	-----	79	23	71	38	22	49	35	54	50	-----	3.96	-----	14	-----	w.	-----	-----	-----	9	8	13	-----	.0	.0	13
Grand Forks	832	11	71	29.00	29.89	-----	61.1	-----	84	10	71	38	14	51	35	57	53	-----	2.06	-----	8	-----	s.	-----	-----	-----	6	9	15	-----	.0	.0	4
Williston	1,878	42	50	27.92	29.88	+.02	60.1	-2.6	81	26	70	35	13	50	33	53	48	68	5.56	+2.1	13	9.2	w.	29	w.	10	12	11	7	5.0	.0	.0	5
Upper Mississippi Valley							71.4	+0.6										75	5.30	+1.1										6.9			
Minneapolis-St. Paul, Minn. [1]	919	32	61	28.95	29.92	.00	66.8	-----	90	5	76	46	13	58	30	60	56	73	2.69	-1.5	10	10.2	se.	42	nw.	11	4	10	16	7.1	.0	.0	6
Springfield, Minn	1,025	4	42	28.83	29.92	-----	66.6	-----	91	11	76	42	13	57	32	61	57	-----	3.73	-----	13	-----	nw.	-----	-----	-----	7	8	15	-----	.0	.0	11
La Crosse [2]	714	11	48	29.18	29.94	+.01	67.7	-.6	86	28	76	45	14	59	27	62	58	76	6.66	+2.6	13	4.3	s.	15	w.	3	4	8	18	7.1	.0	.0	9
Madison [2]	974	70	78	28.94	29.97	+.03	67.2	.0	90	28	75	47	14	59	23	62	58	77	3.21	-.6	16	6.7	se.	26	sw.	5	4	7	19	7.5	.0	.0	11
Charles City	1,015	10	51	28.88	29.95	+.04	67.3	+.8	91	5	77	43	14	58	30	62	58	75	6.43	+1.8	14	6.0	se.	25	s.	3	7	11	12	6.5	.0	.0	11
Davenport [2]	606	66	161	29.30	29.96	+.02	72.0	+1.5	94	4	81	47	14	63	24	64	61	73	3.88	-.2	14	8.4	e.	28	n.	3	3	8	19	7.4	.0	.0	12
Des Moines [2]	860	5	99	29.01	29.91	-.01	71.5	+.9	95	4	81	45	14	62	23	64	61	76	9.00	+4.2	15	8.8	se.	38	nw.	6	5	11	14	6.7	.0	.0	13
Dubuque	699	60	79	29.21	29.95	+.02	69.4	.0	91	4	78	47	14	61	25	63	59	73	5.96	+1.6	14	5.7	se.	23	nw.	3	2	9	19	7.5	.0	.0	11
Burlington, Ia	702	6	35	29.19	29.93	-.01	72.2	+.3	96	4	82	45	14	62	29	65	61	74	4.80	+.1	10	7.2	se.	39	w.	12	4	7	19	7.1	.0	.0	10
Cairo	358	87	93	29.56	29.93	-.04	77.4	+1.1	95	29	87	55	15	68	24	-----	-----	-----	3.51	-.3	13	6.6	sw.	25	e.	8	4	10	16	6.8	.0	.0	11
Peoria [2]	609	11	45	29.31	29.95	.00	71.9	+1.0	96	5	81	44	15	62	30	66	63	79	4.84	+1.1	14	4.1	se.	18	sw.	20	11	13	6	4.6	.0	.0	8
Springfield, Ill [2]	636	5	191	29.27	29.94	-.01	73.9	+1.7	96	4	82	50	15	65	26	67	64	80	5.44	+1.4	17	8.6	s.	32	s.	5	2	8	20	8.0	.0	.0	14
St. Louis [5]	568	179	303	29.34	29.93	-.02	75.0	.0	94	4	82	51	14	67	25	67	64	73	7.24	+3.4	16	9.4	s.	40	se.	25	5	13	12	6.5	.0	.0	17
Missouri Valley							70.8	+0.2										76	5.24	+0.8										6.5			
Columbia, Mo. [2]	784	6	66	29.10	29.92	-.03	73.7	+1.0	94	3	82	45	14	65	26	67	65	79	7.18	+2.4	16	6.2	e.	30	nw.	25	3	16	11	6.6	.0	.0	14
Kansas City [1]	963	38	76	28.90	29.91	-.01	74.2	-----	95	4	82	48	14	66	24	67	62	72	7.35	+2.4	19	9.5	se.	50	nw.	18	5	11	14	6.7	.0	.0	14
St. Joseph [2]	967	11	49	28.90	29.91	-----	73.0	-.7	94	5	82	46	14	64	25	67	65	82	5.61	+.7	16	8.0	e.	34	w.	12	6	12	12	6.2	.0	.0	14
Springfield, Mo. [1]	1,324	5	60	28.55	29.92	-.03	72.2	-----	90	3	81	44	14	63	25	67	64	80	6.01	+1.3	17	8.9	se.	37	se.	17	5	9	16	6.9	.0	.0	15
Topeka	987	65	87	28.87	29.90	-----	74.2	+.8	97	3	84	47	14	64	28	66	63	73	4.83	+.2	16	8.4	s.	33	nw.	20	3	18	9	6.1	.0	.0	11
Lincoln [2]	1,189	11	81	28.65	29.89	-.01	72.2	+.8	94	27	82	48	13	62	29	65	62	79	5.40	+1.1	12	9.1	s.	44	se.	19	4	13	13	6.7	.0	.0	11
Omaha [1]	1,105	31	44	28.76	29.91	.00	72.4	+1.7	96	4	82	48	13	63	26	65	61	71	5.40	+.8	11	11.3	se.	65	n.	19	3	13	14	6.7	.0	.0	10
Valentine	2,598	46	54	27.23	29.91	+.05	65.2	-1.7	84	4	75	42	13	55	29	58	54	72	2.98	+.1	14	8.8	n.	31	se.	18	6	15	9	6.3	.0	.0	15
Sioux City [1]	1,138	5	27	28.71	29.90	.00	69.6	+.1	94	4	80	45	14	60	29	63	59	73	4.83	-----	15	9.0	se.	26	w.	28	6	11	13	6.4	.0	.0	12
Huron	1,301	5	41	28.53	29.90	+.02	66.1	-.1	89	4	76	39	13	57	29	61	57	75	2.42	-1.4	10	12.5	se.	43	se.	16	6	12	12	6.3	.0	.0	12

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments			Pressure			Temperature of the air													Precipitation			Wind										
	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range	Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Total	Departure from normal	Days with 0.01 inch, or more	Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Maximum velocity: Direction	Maximum velocity: Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F		°F	°F		°F	°F	°F	°F.	%	In.	In.		Miles								0-10	In.	In.	
Northern Slope							**59.9**	**−2.5**										**67**	**2.77**	**+0.1**										**6.1**			
Billings [1]	3,570	18	39	26.27	29.89	......	60.4	−4.5	81	30	72	41	13	49	30	51	45	66	2.30	.0	10	10.1	sw.	49	w.	15	7	15	8	5.6	.0	.0	10
Havre	2,507	11	67	27.29	29.90	+.05	59.4	−2.6	83	8	71	36	13	48	38	50	42	65	3.70	+.8	16	10.2	sw.	34	sw.	16	6	8	16	6.3	.0	.0	6
Helena [1]	4,124	5	35	25.78	29.95	+.07	55.9	−3.3	85	30	68	33	21	44	36	48	42	66	1.96	−.4	13	9.6	w.	41	w.	15	4	11	15	6.7	.0	.0	10
Missoula [2]	3,205	80	91	26.62	29.97	......	57.2	−2.8	89	30	68	36	21	46	37	49	44	69	2.05	+.1	14	6.2	w.	27	nw.	20	4	12	14	6.8	.0	.0	3
Kalispell	2,973	48	56	26.90	29.93	+.04	54.8	−2.9	88	30	64	38	17	46	34	49	45	74	4.13	−2.1	18	5.8	w.	21	sw.	16	3	8	19	7.5	.0	.0	10
Miles City [2]	2,371	48	55	27.42	29.89	+.04	62.0	−4.0	84	15	73	42	12	51	31	54	49	70	4.28	+1.6	17	7.1	w.	33	nw.	10	9	12	9	5.2	.0	.0	9
Rapid City [2]	3,259	50	58	26.58	29.90	+.05	61.8	−2.4	85	26	71	36	13	52	29	55	50	70	3.23	−.1	12	7.5	n.	30	nw.	4	3	19	8	6.3	.0	.0	12
Cheyenne [1]	6,094	5	39	23.95	29.87	+.03	58.6	......	81	10	71	33	13	46	34	51	46	70	2.48	+.9	17	9.8	s.	31	w.	28	7	13	10	6.1	.5	.0	12
Lander	5,352	60	68	24.63	29.85	.00	60.0	−.5	87	25	74	37	13	46	37	47	37	49	.04	−1.1	1	5.7	sw.	30	sw.	26	9	14	7	5.1	.0	.0	4
Sheridan [6]	3,790	6	42	26.07	29.90	......	59.3	−2.2	86	25	72	37	13	47	36	51	45	65	1.23	−.8	10	7.9	nw.	35	nw.	18	5	13	12	6.2	.0	.0	11
North Platte [2]	2,821	11	51	26.99	29.86	.00	67.9	+.4	92	3	78	48	13	58	28	60	56	73	5.06	+1.8	16	7.9	ne.	27	nw.	27	9	12	9	5.3	.0	.0	15
Middle Slope							**71.6**	**−0.1**										**69**	**5.28**	**+2.2**										**6.0**			
Denver [1]	5,292	106	113	24.71	29.85	+.01	65.0	−.3	90	26	76	42	13	54	31	53	46	63	1.85	+.5	10	7.4	s.	28	ne.	27	6	15	9	5.7	.0	.0	10
Pueblo [1]	4,690	5	36	25.24	29.81	−.02	68.4	−.6	95	19	82	46	14	54	41	55	47	57	2.88	+1.5	10	8.4	e.	40	nw.	3	9	12	9	5.6	.0	.0	11
Concordia	1,392	50	58	28.45	29.89	−.01	72.5	−.5	95	27	82	47	14	63	25	65	61	73	5.21	+.8	12	7.9	s.	50	nw.	12	6	13	11	6.2	.0	.0	13
Dodge City	2,509	10	86	27.30	29.83	−.04	72.8	+.3	100	26	84	46	15	62	38	63	59	68	6.06	+2.8	10	12.3	s.	49	nw.	18	6	12	12	6.6	.0	.0	11
Wichita [1]	1,358	6	64	28.47	29.88	−.03	73.6	−.8	93	25	84	48	14	64	29	66	63	76	8.69	+4.3	18	15.0	s.	50	nw.	12	7	12	11	6.2	.0	.0	18
Oklahoma City [2]	1,214	10	47	28.60	29.85	−.06	77.1	+1.1	94	12	86	52	14	68	24	70	67	75	6.97	+3.3	13	9.4	s.	24	s.	25	8	11	11	5.9	.0	.0	9
Southern Slope							**79.0**	**+1.1**											**1.44**	**−1.1**										**4.7**			
Abilene [2]	1,738	10	56	28.07	29.82	−.06	80.6	+1.4	106	12	91	60	14	70	32	69	65	68	2.21	−.8	10	10.5	s.	25	n.	15	14	8	8	4.7	.0	.0	8
Amarillo [2]	3,676	10	49	26.19	29.80	−.05	74.4	+1.6	103	19	87	49	14	62	35	62	56	64	2.29	−.6	7	15.0	sw.	39	se.	23	8	12	10	5.5	.0	.0	7
Del Rio	960	63	71	28.82	29.77	−.08	84.0	+.6	108	11	95	65	5	74	32	71	65	59	.70	−1.8	5	10.5	se.	30	w.	9	9	20	1	4.8	.0	.0	5
Roswell	3,566	75	85	26.28	29.78	−.02	77.0	+.7	103	19	92	54	5	62	43	60	50	48	.56	−1.1	7	8.2	s.	29	nw.	23	14	12	4	3.9	.0	.0	5
Southern Plateau							**80.4**	**+1.6**										**27**	**0.12**	**−0.2**										**1.4**			
El Paso [2]	3,778	82	101	26.07	29.72	−.03	83.6	+4.0	104	21	97	63	5	70	37	57	35	26	.52	−.1	2	9.2	w.	25	e.	4	20	9	1	2.4	.0	.0	2
Albuquerque [1]	5,314	5	45	24.69	29.73	......	74.8	+2.	297	19	90	50	5	60	36	53	35	29	.22	−.3	3	11.1	se.	42	e.	7	21	6	3	2.2	.0	.0	4
Phoenix [2]	1,107	39	87	28.60	29.72	−.02	85.0	+.5	112	22	102	62	5	68	43	58	36	24	.00	−.1	0	5.8	e.	22	sw.	25	26	3	1	1.7	.0	.0	0
Tucson [1]	2,555	5	23	27.21	29.74	......	82.9	......	109	22	101	56	8	65	44	56	32	19	.00	−.3	0	......	sw.	......	......	......	24	5	1	1.8	.0	.0	0
Yuma	142	9	54	29.58	29.72	−.02	84.8	+.1	113	30	104	58	8	66	44	63	47	36	.00	.0	0	5.4	sw.	17	w.	14	28	2	0	.6	.0	.0	0
Independence	3,957	5	26	25.88	29.83	+.05	73.6	+1.	396	30	89	48	3	58	36	51	30	......	.00	+.1	0	......	nw.	......	......	......	......	......	......	......	.0	.0	0
Middle Plateau							**64.7**	**−0.4**										**42**	**0.19**	**−0.3**										**2.9**			
Reno [2]	4,527	61	76	25.44	29.92	+.06	61.9	−.5	93	30	77	41	27	47	40	47	34	49	.08	−.2	3	7.0	w.	24	sw.	25	25	4	1	1.8	.0	.0	1
Tonopah	6,090	9	20	24.01	29.84	......	65.1	......	88	30	79	38	26	51	38	46	27	......	T	......	0	......	nw.	......	......	......	......	......	......	......	.0	.0	1
Winnemucca	4,339	5	56	25.59	29.90	+.02	61.6	−1.2	93	30	77	36	12	46	43	47	34	44	.38	−.3	4	7.9	sw.	28	w.	18	15	10	5	3.6	.0	.0	.0
Modena	5,473	10	46	......	29.76	−.06	63.4	+.1	90	22	82	34	28	45	......	......	......	......	T	−.3	0	11.3	sw.	35	s.	2	24	6	0	......	.0	.0	0
Salt Lake City [1]	4,227	86	47	25.53	29.83	−.02	64.8	−.9	92	18	79	42	1	50	41	50	39	46	.47	−.3	3	8.7	se.	30	sw.	25	17	11	2	3.2	.0	.0	6
Grand Junction	4,602	60	68	25.28	29.78	−.05	72.0	+.6	95	17	87	46	28	58	37	51	31	27	.01	−.4	1	7.6	se.	28	w.	27	17	9	4	3.1	.0	.0	2
Northern Plateau							**60.8**	**−2.7**										**57**	**1.28**	**+0.2**										**5.3**			
Baker [2]	3,471	36	54	26.43	29.98	+.03	55.0	−3.6	89	30	68	35	11	42	40	47	42	68	1.02	−.3	7	5.7	n.	16	n.	15	9	13	8	5.2	.0	.0	0
Boise [1]	2,739	5	49	27.11	29.92	+.01	60.8	......	92	30	74	39	12	48	34	51	42	57	.62	......	6	9.0	nw.	31	nw.	25	8	20	2	4.1	.0	.0	2
Pocatello [1]	4,778	5	31	25.43	29.88	+.01	60.4	......	87	30	75	38	13	46	42	48	36	47	.58	......	4	10.6	sw.	34	w.	9	11	14	5	4.9	.0	.0	3
Spokane [1]	1,929	27	42	27.93	29.95	+.01	59.6	−3.2	92	30	71	40	12	48	36	51	45	64	.93	−.4	12	7.5	s.	26	sw.	15	5	12	13	6.5	.0	.0	3
Walla Walla	991	57	65	28.91	29.96	.00	64.6	−1.9	98	30	76	48	12	54	38	......	......	......	2.79	+1.7	11	6.7	s.	21	w.	15	10	8	12	5.7	.0	.0	0
Yakima	1,076	58	67	28.83	29.97	......	64.2	−2.2	99	30	76	43	11	52	35	52	41	49	.37	−.2	7	7.5	nw.	21	w.	15	10	10	10	5.3	.0	.0	0
North Pacific Coast Region							**59.8**	**+0.4**										**73**	**2.55**	**+0.9**										**6.6**			
North Head	211	5	56	29.84	30.06	+.07	56.7	+1.9	94	30	61	48	24	52	23	53	51	83	3.26	+1.0	16	14.5	n.	43	sw.	9	4	6	20	7.5	.0	.0	0
Seattle [2]	125	90	321	29.91	30.04	+.04	60.7	+1.7	97	30	68	49	12	53	35	53	49	72	2.96	+1.6	12	9.2	s.	29	sw.	15	6	8	16	6.8	.0	.0	1
Tacoma	194	172	201	29.78	30.05	+.02	59.2	+.5	91	30	67	46	12	52	28	......	......	......	2.40	+.9	11	9.1	sw.	33	sw.	5	4	10	16	6.9	.0	.0	1
Tatoosh Island	86	9	61	29.95	30.05	+.03	54.6	+1.6	78	30	58	47	9	51	21	52	49	84	5.30	+2.1	12	10.7	w.	38	e.	30	4	4	22	7.6	.0	.0	0
Medford [1]	1,329	29	58	28.62	30.01	......	63.1	−2.1	105	30	77	40	11	49	47	53	44	59	.64	−.1	7	......	nw.	......	......	......	12	7	11	5.0	.0	.0	2
Portland, Oreg. [2]	154	68	106	29.88	30.04	.00	62.4	.0	102	30	71	48	20	54	34	55	50	74	2.04	+.5	16	5.6	nw.	18	sw.	5	7	6	17	6.5	.0	.0	0
Roseburg	510	45	76	29.51	30.06	+.03	61.8	−.7	104	30	74	40	19	50	44	54	47	66	1.28	+.2	9	4.3	n.	17	w.	14	10	8	12	6.0	.0	.0	1
Middle Pacific Coast Region							**65.3**	**+1.0**										**62**	**0.20**	**−0.3**										**3.0**			
Eureka	60	72	88	30.02	30.09	+.04	56.2	+1.9	72	29	61	48	10	52	20	52	50	82	.57	−.2	8	7.7	n.	25	n.	11	12	8	10	5.3	.0	.0	0
Redding [1]	722	20	34	29.13	29.90	......	74.7	−.4	109	30	87	54	6	63	35	56	40	34	.22	−.6	2	9.7	nw.	27	w.	15	20	7	3	2.5	.0	.0	3
Sacramento [2]	66	92	115	29.82	29.89	.00	71.6	+2.2	108	30	87	51	3	56	42	57	48	54	.00	−.2	0	7.7	s.	21	sw.	24	25	4	1	1.5	.0	.0	0
San Francisco	155	112	132	29.78	29.95	−.01	58.6	+.1	88	28	65	50	3	52	28	53	50	77	T	−.2	0	11.6	w.	33	w.	6	20	7	3	2.5	.0	.0	0
South Pacific Coast Region							**68.9**	**+0.2**										**63**	**T**	**−0.1**										**4.1**			
Fresno [1]	327	5	35	29.52	29.86	+.01	75.8	+.1	110	30	92	50	3	59	43	58	44	40	.00	−.1	0	9.4	nw.	24	nw.	5	28	1	1	0.6	.0	.0	0
Los Angeles	338	223	250	29.54	29.90	.00	65.9	−.5	81	21	74	54	1	58	24	59	56	74	T	−.1	0	5.8	w.	18	w.	25	8	18	4	5.2	.0	.0	0
San Diego [1]	87	20	55	29.81	29.91	−.01	64.9	+1.0	75	22	71	56	23	59	18	59	56	76	.01	.0	1	7.0	s.	16	s.	11	0	20	10	6.5	.0	.0	0
West Indies																																	
San Juan, P. R.	82	10	54	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Panama Canal																																	
Balboa Heights	118	6	92	......	29.83	+.01	80.9	+0.8	90	23	87	73	14	75	15	......	......	[3]88	5.59	−2.6	21	5.1	nw.	22	n.	28	0	12	18	7.7	.0	.0	12
Cristobal	36	6	97	......	29.84	.00	81.9	×1.5	91	1	87	75	30	77	14	77	76	[3]86	18.59	+4.6	22	5.6	se.	25	nw.	20	0	6	24	8.9	.0	.0	15

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS—Continued

District and station	Elevation of instruments			Pressure			Temperature of the air									Mean wet thermometer	Mean temperature of the dew-point	Mean relative humidity	Precipitation			Wind					Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms
	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station, reduced to mean of 24 hours	Sea level, reduced to mean of 24 hours	Departure from normal	Mean max.+mean min.÷2	Departure from normal	Maximum	Date	Mean maximum	Minimum	Date	Mean minimum	Greatest daily range				Total	Departure from normal	Days with 0.01 inch, or more	Average hourly velocity	Prevailing direction	Maximum velocity: Miles per hour	Maximum velocity: Direction	Maximum velocity: Date							
	Ft.	Ft.	Ft.	In.	In.	In.	°F.	°F.	°F		°F	°F		°F	°F	°F	°F.	%	In.	In.		Miles								0-10	In.	In.	
Alaska																																	
Anchorage	135	36	47	[4] 29.73	[4] 29.88	----	55.4	+1.9	77	23	64	43	5	47	27	49	45	71	0.68	0.0	5	5.5	nw.	18	sw.	5	6	9	15	----	0.0	0.0	----
Barrow	25	4	27	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Bethel	22	5	32	[4] 29.77	[4] 29.81	----	51.6	−1.4	78	20	62	34	6	41	31	48	43	72	1.35	+.2	9	----	n.	----	----	----	1	7	22	8.1	.0	.0	----
Fairbanks	484	11	87	[4] 29.32	[4] 29.82	----	61.4	+2.9	91	24	73	38	1	49	38	52	44	60	2.75	+1.4	12	6.3	w.	27	sw.	10	3	11	16	7.1	.0	.0	3
Juneau	132	96	116	[4] 29.90	[4] 29.98	----	55.4	+1.2	77	23	62	40	15	48	29	50	46	75	5.97	+1.9	15	5.6	s.	24	se.	13	4	4	22	7.8	.0	.0	0
Ketchikan	75	69	85	[4] 29.98	[4] 30.00	----	55.8	+1.2	77	30	63	43	2	49	26	51	48	79	2.33	−4.1	16	6.0	se.	21	se.	23	2	5	23	8.3	.0	.0	----
McGrath	331	4	31	[4] 29.43	[4] 29.80	----	56.6	----	89	20	68	36	6	45	40	49	43	66	1.93	----	10	----	s.	23	e.	12	3	16	11	----	.0	.0	----
Nome	43	25	51	[4] 29.81	[4] 29.83	----	49.4	+3.7	76	21	57	33	10	42	32	45	42	79	1.36	+.2	12	9.5	w.	37	s.	29	8	10	12	6.1	.0	.0	0
Hawaii																																	
Honolulu	38	86	100	29.98	30.02	----	77.3	+.7	84	3	82	64	15	73	15	69	65	70	1.11	+.2	11	10.0	ne.	26	ne.	15	5	18	7	5.9	.0	.0	1

[1] Data are airport records.
[2] Barometric data (adjusted to old city elevation) and hygrometric data from airport; otherwise city office records.
[3] Observations taken bihourly.
[4] Pressure not reduced to a mean of 24 hours.
[5] Barometric data from airport; other data from city office records.
[6] Wind, clear, partly cloudy, and cloudy data from city office records; other data from airport.

NOTE.—Except as indicated by notes 1, 2, 5 and 6 data in table are city office records.

SEVERE LOCAL STORMS, JUNE 1942

[Compiled by Mary O. Souder]

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Custer, S. Dak., vicinity of	2	1-4:30 a. m.	[1] 10		$10,000	Heavy hail	Loss to buildings and livestock, $8,000; to crops, $2,000; path 10 miles long.
Faith, S. Dak	2	6:30-7:30 p. m.	[1] 4	0	5,500	Tornado and hail	Several buildings destroyed and several moved from their foundations. Roofs punctured and some crops stripped; property damage, $5,000; crops loss, $500.
Pittsylvania Co., Va	2	P. m.			1,000	Hail, electrical	Barn and farming implements and mules burned near Chatham, with $1,000 loss. Crop loss mostly in tobacco, not estimated.
Chouteau County, Mont	3	3:15 p. m.	[1] 5		25,000	Heavy hail	Loss in winter wheat and rye; path 40 miles long.
Delaware and Dubuque Counties, Iowa.	3				2,100	Electrical	Barn burned and cattle killed.
Big Horn County, Mont	4	5 p. m.	[1] 2		10,100	Heavy hail	Loss principally to crops; path 30 miles long.
Minnesota Lake, Minn., vicinity of.	4	7:10 p. m.	[1] 4		1,000	Thundersquall	Farm buildings damaged; trees uprooted; path 1 mile long.
New Albany, Ind	4	P. m.			500	Wind and hail	Trees and houses damaged.
Burlington, Iowa	5	4 p. m.	333		5,000	do	Windows blown in; water tower wrecked; path 880 yards long.
Jackson, Nicollet and Dodge Counties, Minn.	5	5:45-7:10 p. m.			37,000	Hail	Crop loss, $28,000; property damage, $9,000.
Shell Lake, Wis	5	6:10 p. m.	[1] 7		35,000	do	Crop loss, $5,000; property damage, $30,000; hailstones large.
Minnesota Lake, Minn., vicinity of.	5	6:15 p. m.	[1] 2		6,000	Thundersquall	Farm buildings damaged; trees uprooted; path about 3 miles long.
Aurelia, Iowa, vicinity of	6	2:10 p. m.		0		Tornado	Path narrow and 3 miles long; amount of damage not given.
Waverly, Iowa, vicinity of	6	4:30-4:50 p. m.				do	No damage of consequence and no details of the storm available.
Cooney Dam, Mont., vicinity of.	7	10 p. m.	880		6,000	Heavy hail	Chief loss in crops; path 5 miles long.
Montague and Geraldine, Mont., and vicinities.	8	6:30 p. m.	4		150,000	do	Loss to crops; path 25 miles long.
Winifred, Mont., vicinity of	8-9	P. m.			15,000	Heavy hail and wind.	Loss to crops; path 30 miles long.
Bunkie, La., 3 miles northwest.	10	10:15 a. m.	100	0	500	Tornado	Small cabin and outbuildings destroyed; number of trees uprooted.
Judith Basin and Fergus Counties, Mont.	10		[1] 2		10,000	Heavy hail and rain	Loss in crops; path 5 miles long.
Miner and Lake Counties, S. Dak.	11	5:15 a. m.	[1] 4		1,000	Heavy hail	Storm extended from north of Howard into Lake County. Property damage, $1,000; thousands of dollars' loss in crops and livestock.
Evansville, Ind	11	2 p. m.			1,500	Wind	Trees, wires and buildings damaged.
Traverse and Stevens Counties, Minn.	11	2:45-3 p. m.	100	0	11,200	Tornado and hail	Property damaged; trees uprooted; path 8 miles long. At 2:45 p.m. funnel cloud was observed northwest of Dumont, inTraverse County. It descended to earth twice causing property damage and uprooting trees with $1,200 damage over a path 8 miles long. Hail loss to growing crops, $10,000.
Todd County, Minn	11	5 p. m.	[1] 30		15,000	Thundersqualls	Property damaged; path about 20 miles long.
Hawthorne, Wis	11	P. m.		0	500	Tornado	Portion of barn torn off and carried around so that the debris was deposited on the opposite side.
Howard County, Nebr., northern portion.	11	do	[1] 1		4,000	Hail	Loss in small grain.
York County, Nebr., western portion.	11	do	[1] 1		1,000	do	Loss principally in small grain; slight damage to windows and roofs.
Grinnell, Iowa	11				1,500	Electrical	Roof of Grinnell College Dormitory damaged by lightning.
Lyons, Kans., south of	11-12	Near midnight	[1] 2½		75,000	Wind	Much loss in wheat; path 4 miles long.
Rawlins, Lawrence, and Decatur Counties, Kans.	11-12	do	[1] 15		350,000	Heavy hail	Storm occurred over an east-west strip extending from northwest McDonald in Rawlins County, across Lawrence and Decatur Counties. Loss mostly in wheat over a path 60 miles long.
Decatur, Norton, and Phillips Counties, Kans.	12	12:35-2 a. m.	[1] 4-20		350,000	High wind and hail	Storm extended from the northern portion of Decatur County, through Norton, in Norton County, into eastern Phillips County. Considerable property damage in Norton. About 40 barns destroyed in Phillips County. Hail especially severe in northeastern portion of Norton County and the northwestern portion of Phillips County; path 70 miles long.
Upland, Nebr	12	1-4 a. m.	[1] 4		6,000	Hail and wind	Loss mainly to small grain; little damage to buildings.
Naponee, Nebr	12	2-3 a. m.	[1] 4		15,000	Hail, wind, and rain	Loss in small grain; windows broken, roofs damaged, and several barns and sheds collapsed; fields, bridges, and highways damaged by flooding.
Reno County, Kans	12	6 a. m.		1	60,000	Wind	Storm covered greater part of county and was especially severe in Hutchinson, where trees, wires and many buildings were damaged. Loss to crops, $30,000, included in the estimate.
Gosper County, Nebr	12	7 a. m.	[1] 5		5,000	High wind	Buildings damaged; windmills blown down; grain lodged.
McPherson, Harvey, and Marion Counties, Kans.	12	7:30 a. m.	[1] 3		80,000	Violent wind	Storm especially severe over a strip extending from 7 miles northeast of Hesston to the southeastern portion of Marion County. Damage mostly in rural districts; path 40 miles long.
McPherson and Harvey Counties, Kans.	12	do	[1] 3		50,000	Heavy hail	This storm occurred in connection with a violent wind storm. Approximately 1,500 acres of growing crops destroyed and buildings damaged path 10 miles long.
Republic, Cloud, Washington, and Clay Counties, Kans.	12	5-5:30 p. m.	[1] 12		200,000	Heavy hail and wind.	Occurred in the northern part of Cloud and Clay Counties and southern portion of Republic and Washington Counties. Greater part of loss due to hail. Much damage in Clifton, Washington County, and vicinity, where 210 claims were paid by insurance companies. Path 25 miles long.
Oklahoma City, Okla., vicinity of.	12	8:41 p. m., central standard time.	117	35		Tornado and rain	This reported to have been one of the worst tornadoes in the history of Oklahoma. A funnel-cloud seen and an almost deafening roar that could be heard for several miles in all directions reported 110 families affected by the storm; 73 homes demolished and 31 others damaged, while numerous outbuildings were destroyed or damaged and 29 persons received hospitalization. Numerous automobiles destroyed and as many badly damaged. Houses were spattered with mud. Estimate of damage not available.
Lake Providence, La	13	8:30 p. m.			20,000	Wind	Property damage, $5,000; crop loss, mostly uncut oats and corn, $15,000.
Dalton, Pa., and vicinity	13	P. m.			5,000	Rain and electrical	Estimated that from 5 to 6 inches of rain fell in about an hour. Water 4 feet deep in center of the community. Property damaged; bridge washed out.
Glenmont, N. Y	13				8,000	Electrical	Barn burned.
Jaroso, Colo	14	1 p. m.	[1] 1	0	300	Tornado	Damage to buildings and fences.
Parmer and Castro Counties, Tex.	14	8:12 p. m.	[1] 10		750,000	Heavy hail	Loss mostly in crops; some damage to roofs and windows.
Nueces and Jim Wells Counties, Tex.	15	5 p. m.	[1] 50		1,200	Straight-line winds	Property damage, $1,200; considerable crop loss not estimated.
Gannvalley, S. Dak	17	2 a. m.	[1] 3		6,000	Hail	Windows broken; poultry killed; crop loss, $6,000; path 10 miles long.
Nobles, Cass, Hennepin, and Ramsey Counties, Minn.	17	7 a. m-7 p. m.			62,000	Hail and thunderstorms.	Much poultry and many birds perished. Loss to crops, $53,000; property damage, $9,000; path ranged from 3 to 20 miles long.
Holly, Colo	18	4 p. m.	[1] 8		5,500	Hail	Property damage, $5,000; loss in wheat and barley, $500.
Kit Carson, Colo	18	do	[1] 9	0		Tornado and hail	Trees uprooted; buildings and windmills blown down.

[1] Miles instead of yards.

SEVERE LOCAL STORMS, JUNE 1942—Continued

[Compiled by Mary O. Souder]

[The table herewith contains such data as has been received concerning severe local storms that occurred during the month. A revised list of tornadoes will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Elsmore County, Kans., and vicinity.	18	4-5 a. m.			$7,000	High wind	Property damage, $5,000; crop loss, $2,000.
Ness Valley, Kans., southern portion.	18	8:10 p. m.	[1] 5		400,000	Heavy hail	Loss principally to wheat; path 21 miles long.
Douglas, Osage, and Franklin Counties, Kans.	18	11:30 p. m.			50,000	High winds	Especially severe at Centropolis, Franklin County, where residences were unroofed and many farm buildings damaged and some demolished.
Colby, Kans., and vicinity	18		[1] 3		20,000	Heavy hail	Much damage to automobiles, electric signs, and roofs; path 25 miles long.
Platte County, Nebr	18-19	P. m.	[1] 1¼ to 4		1,000	Hail	Property damage, $1,000; small loss to grain and corn.
Pottawatomie County, Kans	19	Midnight-2 a.m.	440		20,000	Wind and hail	Occurred over a strip extending approximately north and south of Westmoreland to Blaine. Some indications that a tornado may have occurred in connection with the general wind storm. Damage mostly to farm property. Much hail fell in some sections; path 15 miles long.
Butte and Spencer, Nebr	19	6-7 a. m.	[1] 1		5,000	Hail	Loss in small grain and corn.
Plymouth, Woodbury, and Ida Counties, Iowa.	19	8:30 a. m.	[1] 4		30,500	Hail and wind	Trees blown down, buildings damaged. Loss to crops in Woodbury County, $30,000; damage to buildings, $500.
Iva, Ind., north of	19	3 p. m.	200	0	5,000	Tornado	Path southwest to northeast; no details.
Milford to Manhattan, Kans., and vicinities.	19	9:30 p. m.	17	0	30,000	Tornado and hail	This storm apparently originated 4 miles northeast of Milford, ending 5 miles northwest of Manhattan. At about the same time, wind caused additional damage in the vicinities of Junction City and Fort Riley; path 12 miles long.
Riley, Kans., vicinity of	19	10 p. m.	440	0	9,500	Tornado	Damage to farm property, $8,000; loss in crops, $1,500; path 2 miles long.
Haigler, Nebr	19	P. m.	[1] 5		2,000	Hail	Loss principally in wheat.
Warnertown, Pa	19	do	200		5,000	Wind, electrical	Roofs damaged; tower wrecked; trees uprooted; electric service disrupted; man injured.
Angelica, N. Y	19		[1] 3		2,000	Hail	Loss in canning peas; path 5 miles long.
Onondaga County, N. Y	19		1,320		30,000	do	Loss in tobacco, corn, potatoes, wheat, apples, and cherries. Some individual crops a total loss; path 25 miles long.
Loup and Valley Counties, Nebr.	19-20	P. m.	[1] 3-5		25,000	Hail, wind, and rain.	Most damage from hail; fields flooded.
Waverly, Raymond, Ceresco, and Wahoo, Nebr., and vicinities.	19-20	do	[1] 10	1	30,000	do	Barns and small buildings damaged; loss in grain.
Pottawattamie, Mills, and Fremont Counties, Iowa.	19-20	do			206,100	Heavy rain and wind.	Crop loss in Pottawattamie County, $100,000, and damage mostly to buildings and roads in Council Bluffs, $100,000. Railroad tracks washed out in numerous localities and trains delayed. Other damage reported near Randolph where 3.50 inches of rain fell.
Omaha, Nebr	19-20	11 p. m., of 19th-6 a. m., 20th.			4,000	do	Maximum wind velocity of 65 miles an hour and 3.48 inches of rain recorded during this storm. Damage to trees and transmission lines, $2,000; from flooding, $2,000.
Oketo, Lillis, and Vermillion, Kans., and vicinities.	20	1-2 a. m.	[1] 1		80,000	High winds	Damage to farm property, $50,000; loss to crops, $30,000; path 20 miles long.
Indianapolis, Ind., west of	20	6 p. m.	20	0	2,500	Tornado	Path southwest to northeast, about a mile long. Trees and Buildings damaged.
Clinton and Howard Counties, Ind.	20	6:30 p. m.	167	4	500,000	Tornado	Greatest damage at Kokomo; many persons injured; path from southwest to northeast and about 35 miles long.
Kimball County, Nebr	20	7-9 p. m.	[1] 2-5		50,000	Hail	Principal loss in wheat. Storm moved across the country from west-northwest to east-southeast.
Mulvane, Kans., vicinity of	20	8:32-8:50 p. m.	440	4	85,000	Tornado and hail	Property damaged; path 8 miles long.
Scott County, Kans	20	11 p. m.-midnight.	[1] 4-10		500,000	Heavy hail and wind.	Between 30,000 and 40,000 acres of wheat destroyed and other crops badly damaged. In some places hailstones were 10 inches deep; path 25 miles long.
Pawnee City, Nebr	20	P. m.	[1] 5		6,000	Hail, wind, and heavy rain.	Small acreage of grain severely damaged by hail; fields flooded, farm buildings blown over.
Modoc, Kans., 2½ miles west	20			0		Tornado	12 cars blown from a moving Missouri Pacific train; number of small buildings damaged. Estimate of damage not given.
Wichita County, Kans., southern portion.	21	6:30 p. m.	[1] 1		30,000	Heavy hail	Damage over path 10 miles long; no details.
Kearney, Kans., northeastern portion.	21	7-7:30 p. m.	[1] 7		75,000	do	Loss chiefly to wheat with 90 percent loss in some areas; path 18 miles long.
Pittsburgh, Pa	21			1	10,000	Electrical	Steam generator and powerhouse at steel plant struck by lightning; man killed; trees uprooted; electric service distrupted.
Clayton, N. Mex	21-22	8-9 p. m.	[1] 15		10,500	Hail	Some sheep and cattle killed.
Wichita County, Kans., northern portion.	21-22	11:30 p. m.-1:30 a. m.	[1] 8-10		350,000	Heavy hail	Loss principally in wheat; path 24 miles long.
Bellview, N. Mex., vicinity of	22	7-7:30 p. m.	[1] 4		10,000	Hail	Loss principally in wheat.
Clayton, N. Mex	22-23				40,000		Crop loss, $22,000; property and livestock loss, $18,000.
Mayhill, N. Mex	23	2-3 p. m.	[1] 3		1,000		Loss mostly in fruit.
Hardin, Mont., vicinity of	24	5 p. m.	[1] 3		10,000	Heavy hail	Loss in crops; path 35 miles long.
Chouteau and Teton Counties, Mont.	25	5:30 p. m.	[1] 6		250,000	do	Began in Power, Teton County, and terminated near Chouteau County line; path 36 miles long.
Benchland and Windham, Mont, vicinity of.	25	6 p. m.	[1] 1		10,000	do	Loss in crops; path 5 miles long.
Buena Vista County, Iowa	27	1:30 p. m.	[1] 2		25,000	Hail	Considerable damage; path 10 miles long.
Ellis and Rooks Counties, Kans.	27	5 p. m.-midnight.	[1] 8		400,000	Heavy hail	Much wheat completely destroyed; chickens killed, windows broken and automobiles damaged; path 35 miles long.
Santee, Nebr	27	6 p. m.	440	0	10,000	Tornado	Damage to buildings, $5,000; to personal property, $5,000; 1 person injured.
Estherville, Iowa	27	10:30 p. m.			1,000	Hail, electrical	Trees and wires down; 1 person injured.
Guthrie, Dallas, Polk, Grimes, Boone, Story, and Marshall Counties, Iowa.	28	6:15-7 p. m.		1	148,150	Tornado and rain	Much property damaged; trees uprooted. At Dodge Field, near Des Moines, a hangar was wrecked, a building moved off its foundation and 4 planes damaged. Heavy rains caused erosion near Cumberland and 3 inches of rain were reported from Anita. Pastures and fields flooded. In Polk County, the heavy rain flooded streets and highways and caused small streams to overflow. In some sections a crop loss was heavy. Several persons were injured.
Houston County, Minn	28	8 p. m.	33		10,000	Thundersquall	This storm a possible tornado. Number of farm buildings wrecked or damaged. Trees uprooted lay on the ground mostly in the same direction; length of path 10 miles. The storm crossed the State line from Minneshiek and Allamakee Counties, Iowa where greatest damage occurred.
Minnesota, extreme southeastern Counties.	28	P. m.			90,000	Rain and flood	Heavy to excessive rains in connection with severe thunderstorms caused much damage to highways and bridges and railroads. Sewers overflowed and many streets, basements, and stores flooded. Hillsides washed; lowlands inundated with much loss in growing crops.
Ladysmith, Wis	28				2,000	Wind	Barn and silo blown down, another barn damaged.
Ruston, La	28				10,000	Thunderstorm	2 large barns destroyed by fire, and 3 cows and a quantity of feed lost.
John Martin Dam, Colo	29	5:10 a. m.	[1] 10		50,000	Hail	Loss in corn, small grain, hay, beets, and melons. 125 sheep and 400 turkeys killed.

[1] Miles instead of yards.

474053—42——3

LATE REPORTS FOR APRIL 1942

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Chippewa and Clark Counties, Wis.	4	5 p. m.	55–100	0	$60,000	Tornado	The tornado cloud lifted several times so that some areas in the path were untouched. At least 15 barns demolished and several damaged. Damage to 3 houses and a cheese factory; several small buildings destroyed; 20 cows and 2 horses killed. Small crop loss because early season; length of path 18 miles.
Minnesota, extreme southeastern counties.	5	9:20 p. m.			5,000	Sleet and glaze	Communication and electric service disrupted. Ice, beginning to form at 9:20 p. m., remained on the wires about 12 hours. Trees and shrubbery coated with glaze. Roads very slippery: number of motor accidents occurred.
Erick, Okla.	26	12:05–1:30 a. m.	[1] 2		3,500	Heavy hail	Property damage, $500; loss in crops, $3,000. The storm moved from the southwest over a path 7 miles long.
Clinton, Okla.	26–27	7:23 p. m., of 26th–2:30 a. m., of 27th.	[1] 2½		185,000	do	Property damage, $150,000; loss in crops, $35,000; path 10 miles long.
Talala and Chelsea, Okla., and vicinities.	27	3:45 p. m.		0		Tornado	Several buildings and other property destroyed. Estimated loss several thousand dollars. Path narrow and 15 miles long.
Minnesota, southern counties.	27–28	P. m., and a. m.			108,000	Thundersqualls	Many barns, outbuildings, silos, and windmills wrecked; houses damaged, windows broken, signs and awnings torn away, poles and wires down, trees uprooted, and growing crops slightly damaged. The general direction of the storm was from southwest to northeast over a path about 200 miles long.
Dubuque, Iowa	28				4,000	Thunderstorm, excessive rain, and hail.	Lawns and gardens washed; streets flooded and blooms knocked off cherry and plum trees.
Harrison, Monono, and Woodbury Counties, Iowa and vicinities.	28	7:30 p. m.–midnight.			18,400	Wind and rain	There were reports of scattered damage in all sections of the State. Two men injured when blown off a roof in Woodbury County.
Murdock, Minn., and vicinity.	30	9:30 p. m.	500		3,000	Thundersqualls	Property damaged. Storm moved from the southwest to northeast over a path 9 miles long.
Todd County, Minn., northwestern portion.	30	11:45 p. m.	880		5,000	Hail	Considerable damage to property; much poultry perished. Growing crops not advanced enough to be injured. The storm moved from the southwest to northeast over a path about 3 miles long.
Roseau, Wadena, and Big Stone Counties, Minn.	30				100,000	Rain and flood	Heavy to excessive rains near the close of April caused considerable damage to highways and bridges. Lowlands inundated and growing crops damaged. Loss to tangible property, $40,000, farm property and prospective crops, $57,000, and to livestock, $3,000.

[1] Miles instead of yards.

SOLAR RADIATION AND SUNSPOT DATA FOR JUNE 1942

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JUNE 1942

[Communicated by Capt. J. F. Hellweg, U. S. N. (Ret.), Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, under longitude, latitude, area of spot or group, and spot count, are included assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups, and total spot count.

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1942	h m		°	°	°	°				
June 1	10 45			No spots					G	Mt. Wilson.
June 2	10 39	7444	−53	345	+12	55	48	6	G	Do.
				(38)	(−1)	------	48	6		
June 3	14 42	7444	−36	346	+12	38	36	3	G	U. S. Naval.
				(22)	(−1)	------	36	3		
June 4	10 32	7444	−24	347	+12	27	24	1	G	Do.
				(11)	(0)	------	24	1		
June 5	10 45	7444	−15	343	+13	20	12	1	G	Mt. Wilson.
				(358)	(0)	------	12	1		
June 6	10 48	7445	−1	344	+12	12	145	10	G	U. S. Naval.
		(*)	+25	10	+11	28	12	2		
				(345)	(0)	------	157	12		
June 7	11 22	7446	−47	284	+5	48	12	2	F	Do.
		7445	+13	344	+12	18	145	8		
		(*)	+22	353	−6	23	6	3		
				(331)	(0)	------	163	13		
June 8	13 20	7445	+27	344	+12	30	133	6	F	Do.
				(317)	(0)	------	133	6		
June 9	8 25	7445	+40	346	+13	42	97	2	G	Mt. Wilson.
				(306)	(0)	------	97	2		
June 10	10 45	(*)	0	292	+21	21	6	1	G	Do.
		7445	+53	345	+13	54	24	1		
				(292)	(0)	------	30	2		
June 11	9 6	7445	+67	346	+13	68	12	1	G	Do.
				(279)	(+1)		12	1		
June 12	10 34			No spots					G	U. S. Naval.
June 13	11 52			No spots					G	Do.
June 14	11 6	(*)	−17	222	+10	20	12	2	G	Do.
		7447	0	239	+11	11	48	4		
				(239)	(+1)		60	6		
June 15	10 47	7447	+13	238	+11	17	36	3	G	Do.
				(225)	(+1)		36	3		
June 16	12 48	7448	−79	132	+6	79	194	1	F	Do.
				(211)	(+1)		194	1		
June 17	10 46	7448	−67	132	+6	67	291	9	G	Do.
		(*)	+25	224	−10	27	6	1		
				(199)	(+1)		297	10		
June 18	10 39	7448	−53	133	+6	53	194	7	G	Do.
		7450	−33	153	−10	35	6	1		
				(186)	(+1)		200	8		
June 19	12 31	7448	−42	130	+7	43	97	9	G	Do.
		7448	−35	137	+6	36	97	1		
		7450	−19	153	−10	23	73	7		
				(172)	(+2)		267	17		
June 20	10 30	7448	−29	130	+7	30	73	10	VG	Do.
		7448	−22	137	+6	23	97	1		
		7450	−6	153	−10	13	73	8		
				(159)	(+2)		243	19		
June 21	11 8	7448	−16	130	+7	17	48	5	G	Do.
		7448	−8	138	+6	10	73	1		
		7450	+9	155	−11	17	48	3		
		7451	+42	188	−3	42	6	1		
				(146)	(+2)		175	10		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR JUNE 1942—Continued

Communicated by Capt. J. F. Hellweg, U. S. N. (Ret.), Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day, under longitude, latitude, area of spot or group, and spot count, are included assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups, and total spot count.

Date	Eastern standard time	Mount Wilson group No.	Heliographic: Difference in longitude	Heliographic: Longitude	Heliographic: Latitude	Heliographic: Distance from center of disk	Area of spot or group	Spot count	Plate quality	Observatory
1942	h m		°	°	°	°				
June 22	10 48	7448	−2	131	+7	8	48	4	G	U. S. Naval
		7448	+5	138	+6	6	73	1		
				(133)	(+2)		121	5		
June 23	10 59	7448	+13	132	+7	14	73	6	G	Do.
		7448	+20	139	+6	21	73	1		
				(119)	(+2)		146	7		
June 24	10 32	7448	+26	132	+6	27	48	5	G	Do.
		7448	+33	139	+5	33	73	6		
		7452	+43	149	−10	45	6	2		
				(106)	(+2)		127	13		
June 25	10 34	(*)	−32	61	−13	35	12	3	F	Do.
		7448	+47	140	+6	47	97	8		
		7452	+59	152	−11	60	48	3		
				(93)	(+2)		157	14		
June 26	10 44	7453	+49	129	+4	49	24	2	G	Do.
		7448	+60	140	+5	60	48	2		
		7452	+70	150	−11	71	24	3		
				(80)	(+2)		96	7		
June 27	8 39	7453	+63	131	+5	63	73	4	F	Mt. Wilson.
		7453	+67	135	+4	67	48	5		
		7448	+77	145	+4	77	48	1		
				(68)	(+2)		169	10		
June 28	9 31	7453	+76	130	+5	76	97	6	P	Do.
				(54)	(+3)		97	6		
June 29	11 1			No spots					G	U. S. Naval.
June 30	10 38			No spots					G	Do.

Mean daily area for 30 days=103

(*) Not numbered.
VG=very good; G=good; F=fair; P=poor.

PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR MAY 1942

[Based on observations at Zurich, except at Locarno on May 15. Data furnished through the courtesy of Prof. W. Brunner, Eidgen. Sternwarte, Zurich, Switzerland]

May 1942	Relative numbers	May 1942	Relative numbers	May 1942	Relative numbers
1	51	11	....	21	14
2	38	12	31	22	a 11
3	30	13	a 40	23	9
4	31	14	54	24	8
5	a 27	15	*a 32	25	8
6	25	16	ad 52	26	15
7	d 25	17	46	27	7
8	20	18	35	28	15
9	d 25	19	34	29	0
10	d 29	20	26	30	0
				31	7

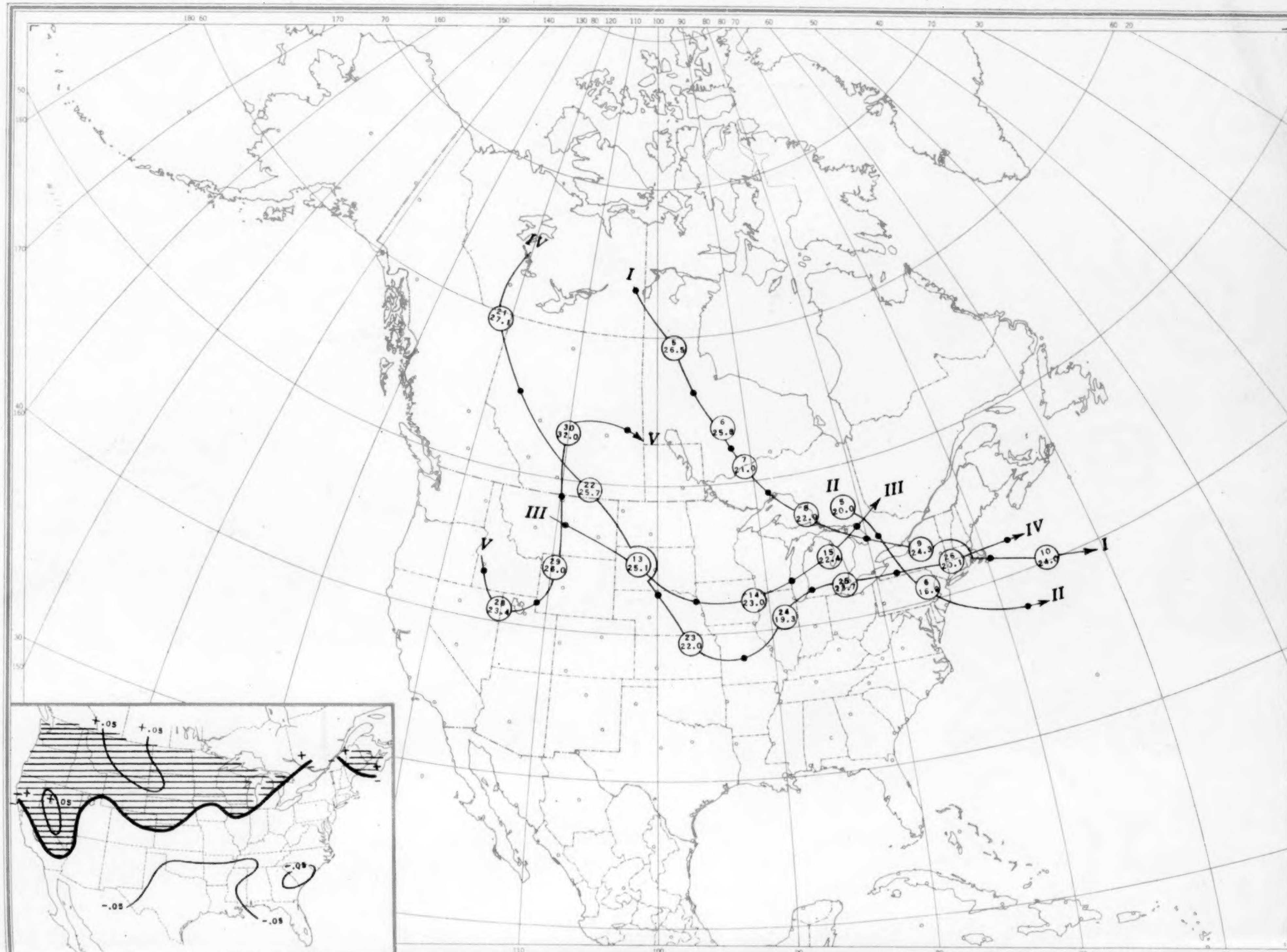
Mean, 30 days=24.8

*=Observation at Locarno.
a=Passage of an average-sized group through the central meridian.
d=Entrance of a large or average-sized center of activity on the east limb.

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, June 1942

Chart I. Departure (°F.) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, June 1942

Chart II. Tracks of Centers of Anticyclones, June 1942. (Inset) Departure of Monthly Mean Pressure from Normal

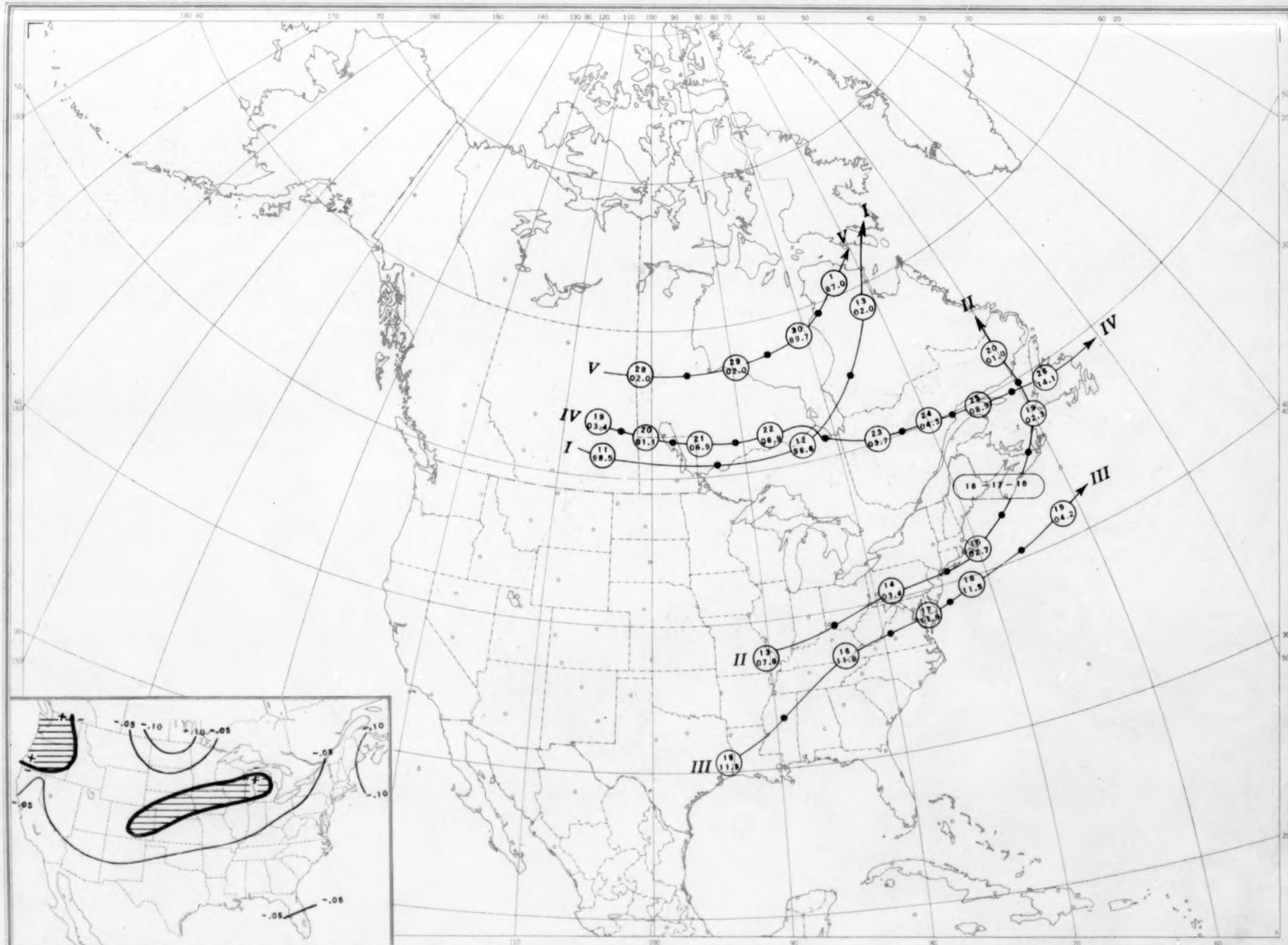


Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, June 1942. (Inset) Change in Mean Pressure from Preceding Month

Circle indicates position of anticyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of anticyclone at 7:30 p. m. (75th meridian time).

Chart III. Tracks of Centers of Cyclones, June 1942. (Inset) Change in Mean Pressure from Preceding Month



Circle indicates position of cyclone at 7:30 a. m. (75th meridian time), with barometric reading. Dot indicates position of cyclone at 7:30 p. m. (75th meridian time).

Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, June 1942

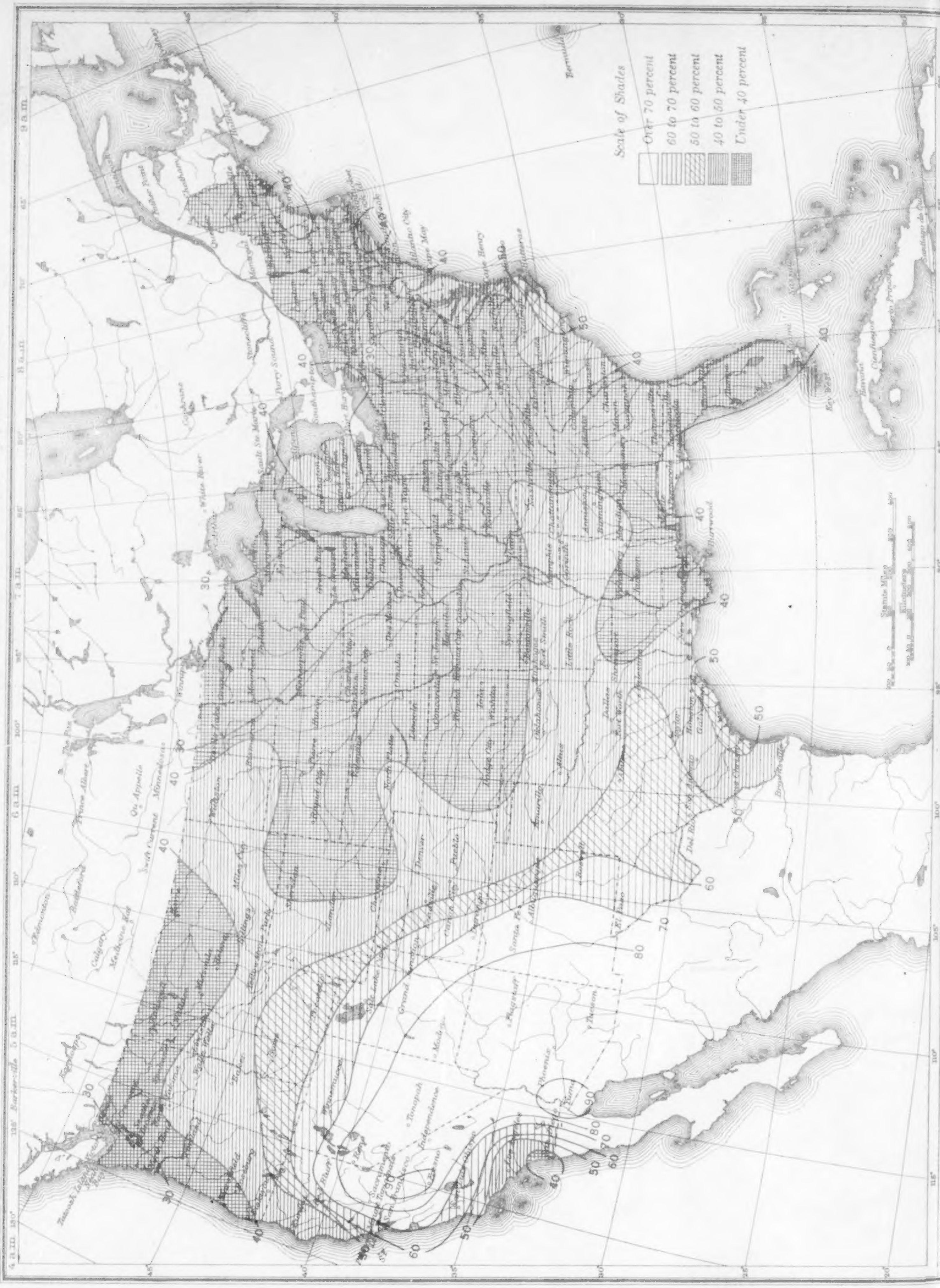


Chart V. Total Precipitation, Inches, June 1942

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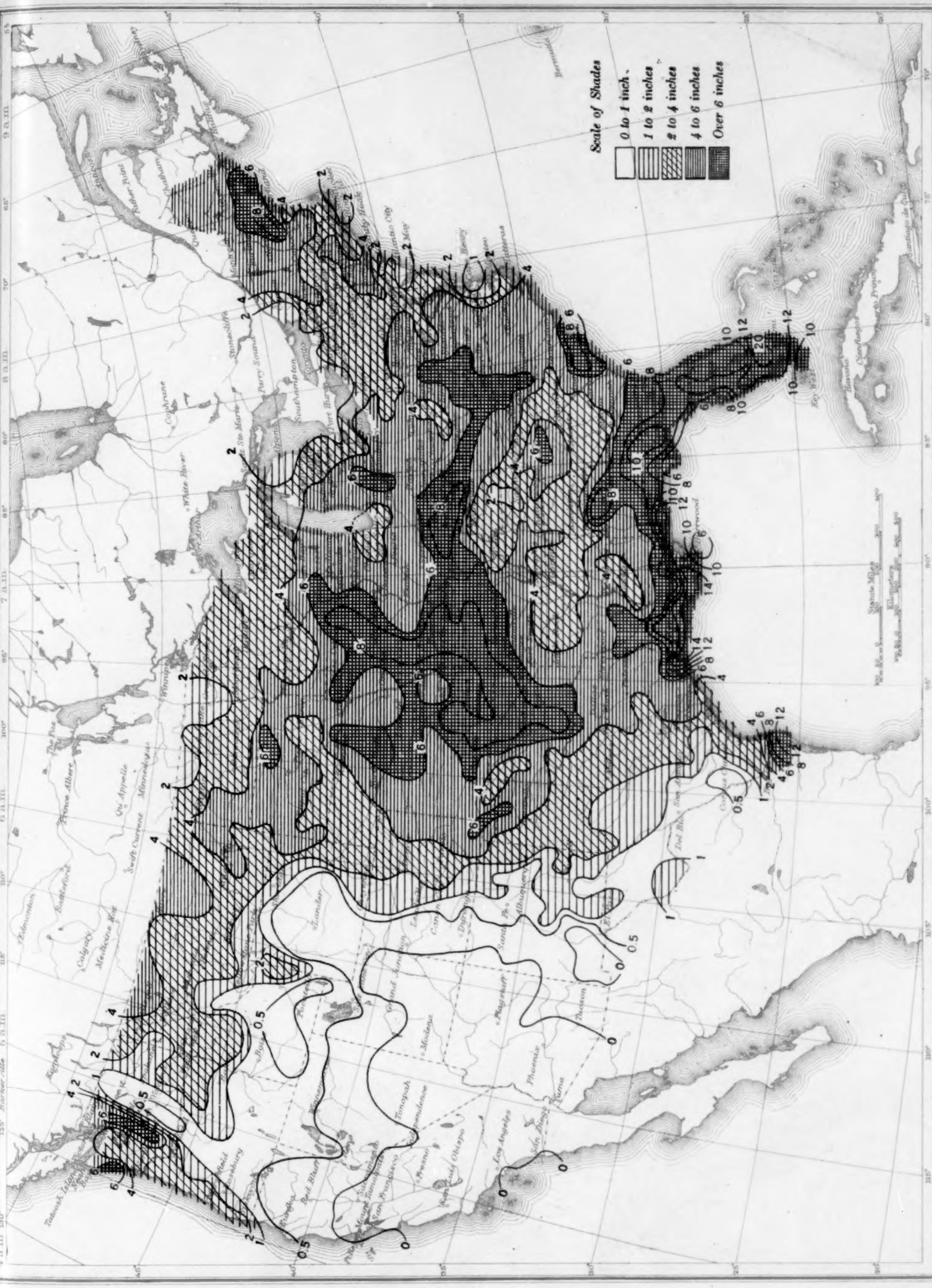

Chart VI. Isobars at Sea Level and Isotherms at Surface; Prevailing Winds, June 1942

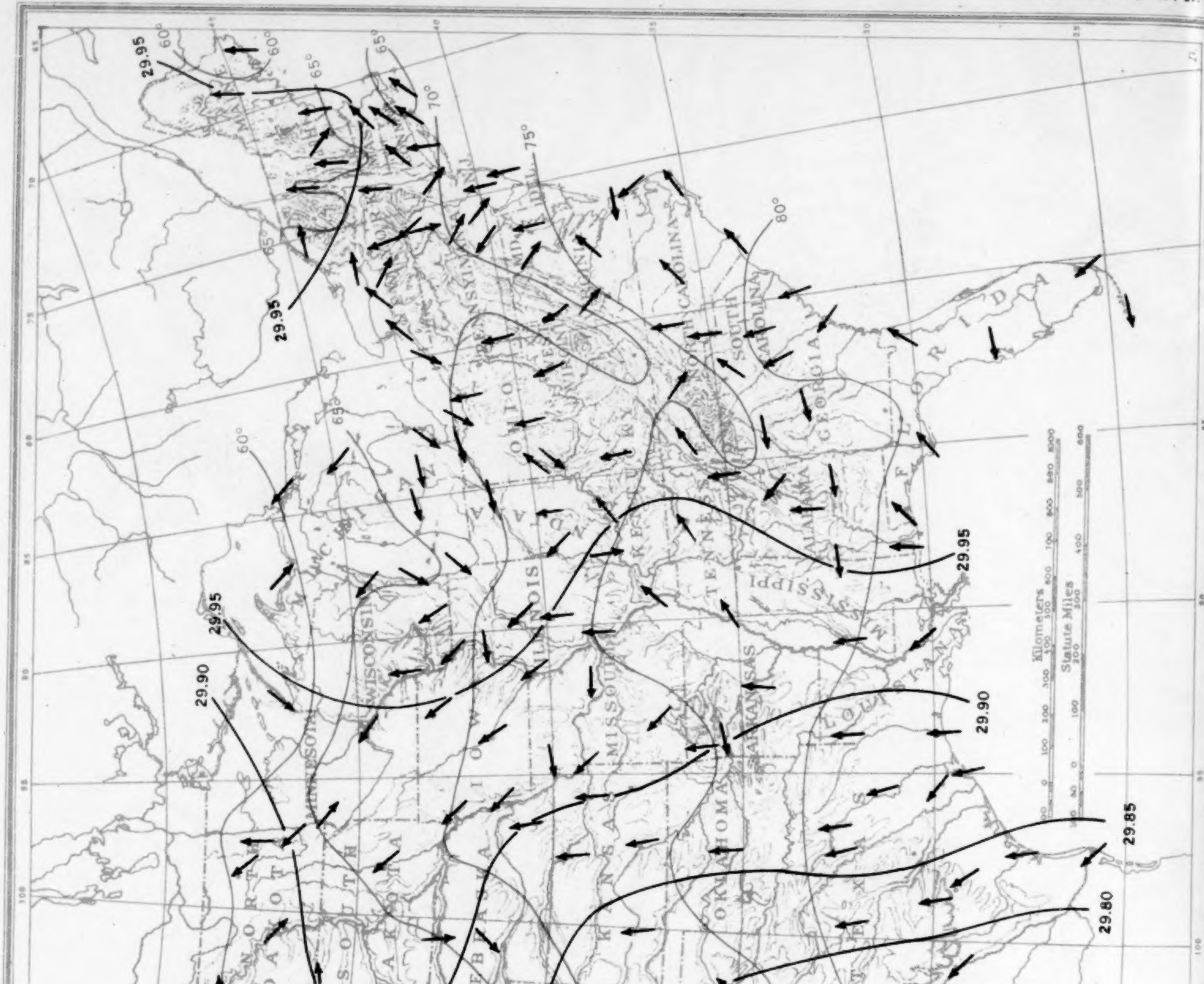

Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s.l.) June 1942

Chart VIII. Isobars (mb) for 1,524 Meters (5,000 ft.) and Isotherms (°C.) and Resultant Winds for 1,500 Meters (m. s. l.) June 1942

Isobars and isotherms based on radiosonde observations at 11:00 p. m. (E. S. T.) and winds based on pilot-balloon observations at 5:00 a. m. (E. S. T.).

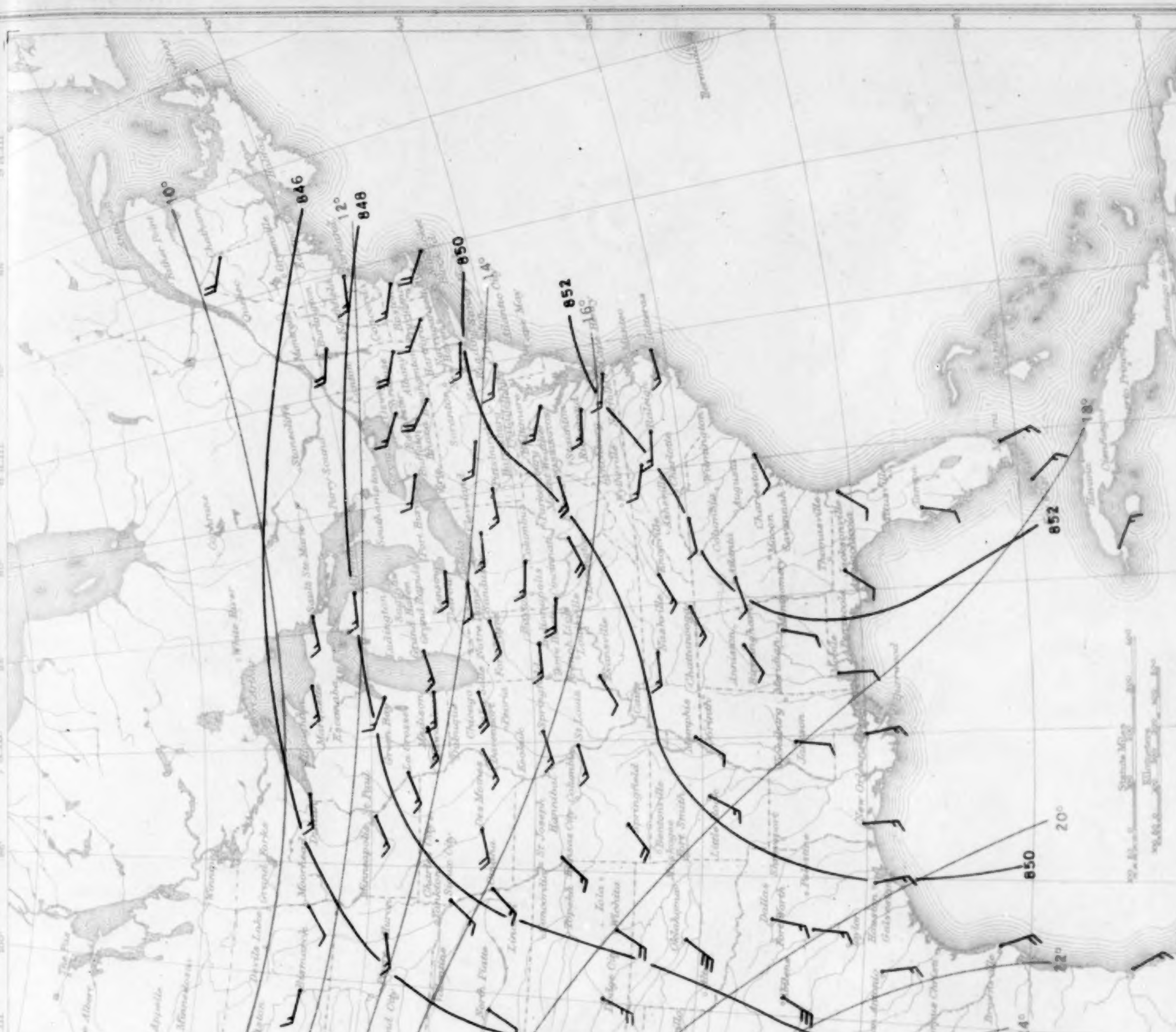

Chart IX. Isobars (mb) Isotherms (°C.) 11:00 p.m. (E.S.T) and Resultant Winds 5:00 a.m. (E.S.T.) for 3,000 Meters (m.s.l.) June 1942

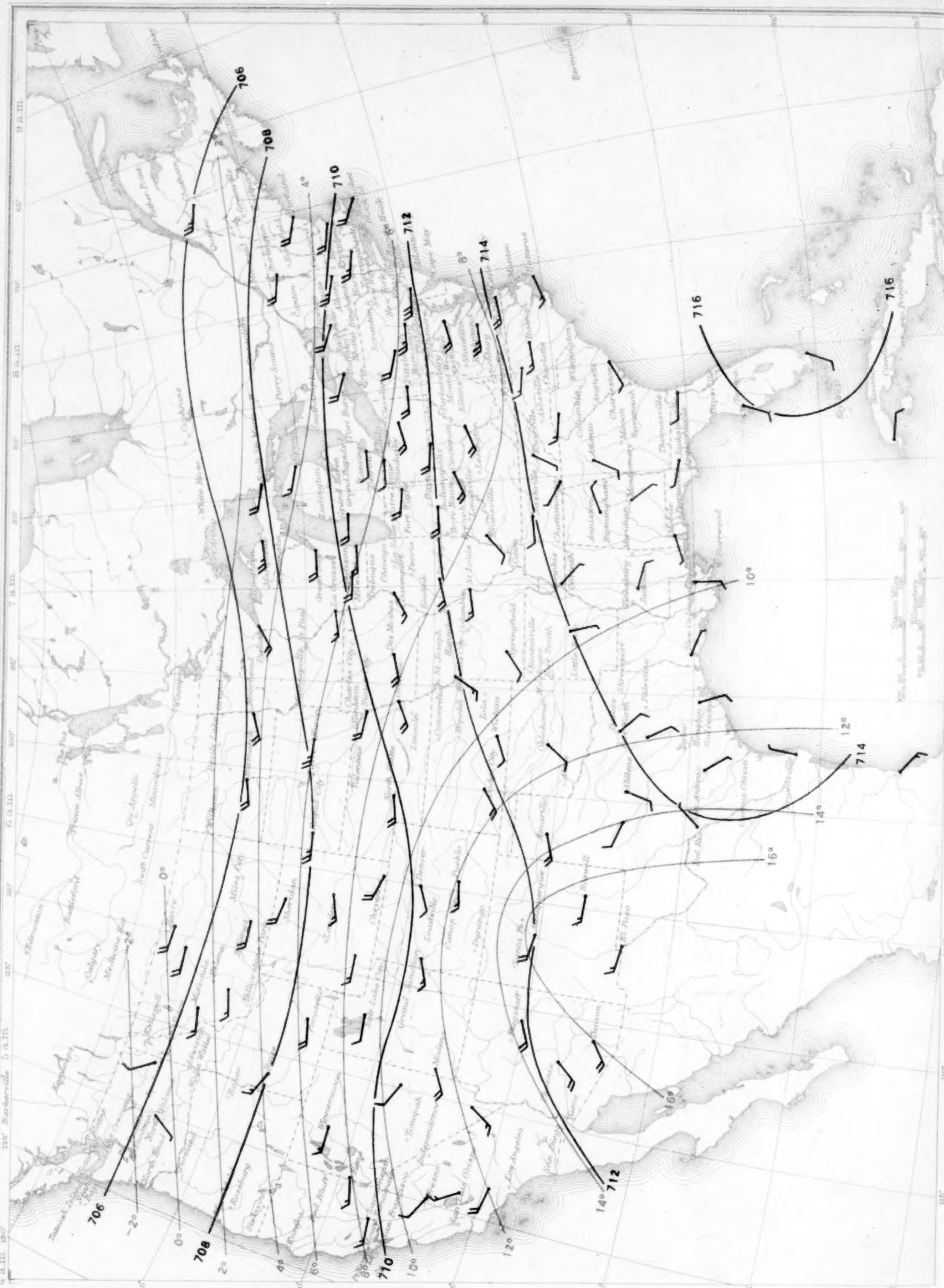

Chart X. Isobars (mb) Isotherms (°C.) 11:00 p.m. (E.S.T.) and Resultant Winds 5:00 p.m. (E.S.T.) for 5,000 Meters (m.s.l.) June 1942

Chart X. Isobars (mb) Isotherms (°C.) 11:00 p.m. (E.S.T.) and Resultant Winds 5:00 p.m. (E.S.T.) for 5,000 Meters (m.s.l.) June 1942

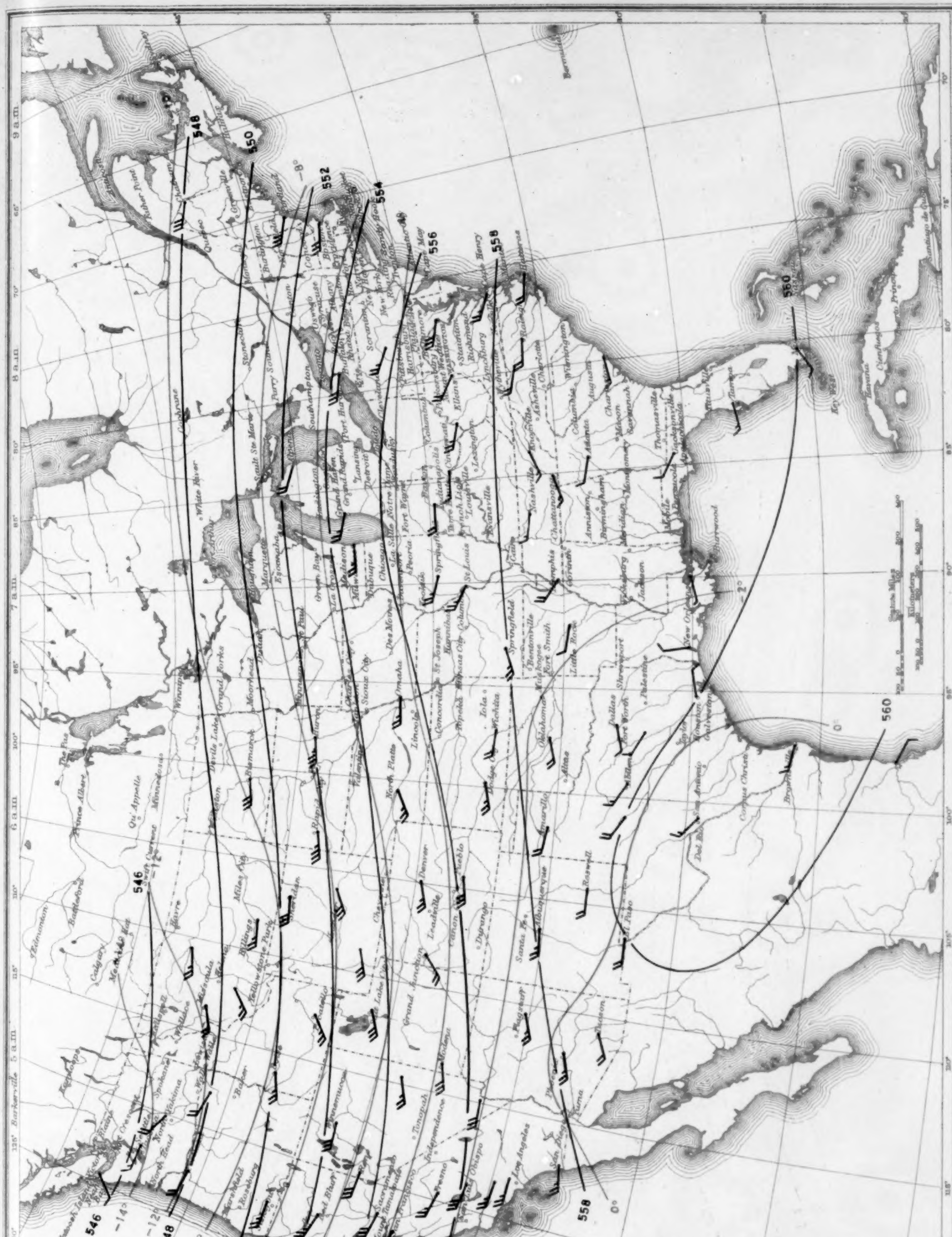

Chart XI. Isobars (mb) Isotherms (°C.) 11:00 p. m. (E. S. T.) and Resultant Winds 5:00 p. m. (E. S. T.) for 10,000 Meters (m. s. l.) June 1942